CA2RE Conference for Artistic and Architectural (Doctoral) Research

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CA²RE

CONFERENCE FOR ARTISTIC AND
ARCHITECTURAL (DOCTORAL) RESEARCH

PROCEEDINGS

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CA²RE

CONFERENCE FOR ARTISTIC AND ARCHITECTURAL (DOCTORAL) RESEARCH

PROCEEDINGS

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ELIA


H. HANSEN


PROGRAM FOR FORSK
13 – 15APR
INTERNATIONAL CONFERENCE CAIRE
19APR
17.00 – 18.00
ROBOTTER OG ARKITEKTUR
20APR
16.00 – 18.00
ÅBNING AF FORSKNINGENE OGSÅ: HVEM FORSKER VI FOR? OFFENTLIG PANELDEBAT MED UDSTILLINGENS FORSKERE
23APR
17.15 - 19.30
FREMTIDENS ARKITEKTPRAKSIS
24APR
13.00 – 15.00
VAND – RESSOURCE ELLER PROBLEM?
15.00 – 17.30
UDKANTSDANMARK – AFVIKLING ELLER UDVIKLING?
FORSK!

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REFLECTIONS ON THE AARHUS CA²RE CONFERENCE

CLAUS PEDER PEDERSEN

The third CA²RE Conference took place at Godsbanen, Aarhus, 13-16 April 2018. Aarhus School of Architecture organised the conference in association with ARENA, EAAE and ELIA. CA²RE is an acronym for the Conference for Artistic and Architectural (Doctoral) Research. It aims to create an inviting and inclusive setting where senior and early-career researchers meet to present and discuss research projects and improve research quality through intensive peer-reviews. The CA²RE conferences are biannual events, and the supporting network has been growing since the inaugural CA²RE held at KU Leuven, Ghent in the spring of 2017.

The CA²RE conferences did to no small extent grow out of the ADAPT-r (Architecture, Design and Art Practice Training-research) ITN network. ADAPT-r organised biannual Practice Research Symposia (PRS) to provide a supervisory structure for the advancement of practice-based PhDs. The biannual symposia became an important event for the sharing and developing of how to structure and improve the research, to share methods and approaches and merely to follow the development of the research.
The CA²RE conference has inherited essential elements from the PRS: CA²RE is organised biannually. It addresses early-stage researchers by focusing on learning and supervision and providing ample time to present and discuss each presentation rather than promoting specific research questions or topics. But there are also significant differences. ADAPT-r addressed a closed group of practice-based PhDs recruited jointly by the partners of the network while CA²RE is an open network associated with ELIA, EAAE and ARENA. The CA²RE conference wishes to contribute to the expansive and diverse fields that exist in architectural and artistic research, without giving priority to any single approach. The conference supports established research methods but especially welcomes new and emerging approaches and areas such as research by design and artistic/creative practice.

To allow equal access to the conference we have established a two-stage peer-review process. The first stage of peer-review is performed on the submitted abstracts. Each abstract is checked blindly by three independent reviewers. The highest scoring abstracts are admitted for the limited number of presentation slots. Due to growing interest, entry into each conference has been more competitive than for the previous

one. Almost all submissions for the Ghent CA²RE conference in 2017 were accepted. In Ljubljana, about two-thirds of the abstracts were accepted, and in Aarhus 38 of 82 abstracts were allowed.

The second-stage review takes place at the full-paper stage. The authors of accepted abstracts are requested to submit the full paper before the conference, but contrary to most conferences the reviewing takes place at the event. 60 minutes are assigned to each presentation, and the presenters are asked to update their contributions after the conference in response to the comments of the panel. The panels are also invited to provide feedback on the most successful presentations, which will subsequently be promoted to the AJAR Journal where they will be submitted to further peer-review before their potential publication.

We have chosen this peer-reviewing process in response to CA²RE's ambition of supporting early-stage research and supervision. We are, however, still searching for the right balance between creating an inclusive setting for developing emerging research and providing a rigorous peer-reviewing. The increasingly competitive selection process might easily exclude researchers who are in the early or messy middle stages of their research, where the research questions are still open-ended or where initial findings have not yet started to fall into place. While it makes sense not to select these contributions for an academic conference, it might be the unresolved or in-between projects that touch upon central questions and challenges in artistic and architectural research and allows productive conversations to unfold. Conversely, from another perspective, the peer-reviewing process might be questioned from

an established academic perspective. We consider the process rigorous. The generous time given to each presentation allows for critical engagement of peers and the face-to-face engagement supports the ability to engage in hybrid modes of presentation that include interaction with artefacts and visual representations as well as performances. However, the second stage review of papers is not blind and thus deviates from recognised academic standards. The CA²RE network will most likely continue to modify and experiment with the format of the conferences in the future to find ways of addressing these challenges.

The CA²RE conferences are not based on specific topics. They address all early-stage researchers within the fields and aim to provide a generous and inclusive frame for the discussion and development of their research projects. The CA²RE conferences value dialogue and discussions highly and allocate substantial time to each presentation to allow for thorough reviews. Despite the lack of a general theme for the conference, some shared topics and research interests emerged across the accepted abstracts. The presentations were organised in three parallel tracks according to the identified shared interests. A group of abstracts focused on digital design and fabrication, and on technology, construction and tectonics. A second group focused on (architectural) practice and design processes and on artistic research with a particular focus on drawing in architecture. A third group dealt with urbanity, community-building and design and planning processes.

We have used the groupings from the conference to group the papers in the proceedings. This organisation will hopefully help the reader navigate the otherwise quite diverse contributions.

We have deliberately set very few guidelines for the papers and invited the authors to design the layout of their contribution. This freedom has been an invitation to experiment and explore how the interplay of text and visual material can help disseminate research and reflect CA²RE's ambition to support artistic and practice-based research.

Siv Helene Stangeland gave a keynote lecture to open the CA²RE Conference. She is a partner in the Norwegian architectural practice Helen & Hard. This practice formed the empirical foundation of the practice-based PhD that she did at Aarhus School of Architecture as part of the EU-funded ADAPT-r ITN. We invited her to reflect on how the PhD has influenced her practice, and she presented not only an exciting and original research process but also thought-provoking insights into the aim and impact of practice-based research. CA²RE concluded with a workshop titled "Research Methods Training, Supervisory and Evaluator Training - Relevance of Architectural Research Training". In the workshop PhDs and supervisors were invited to share observation and reflections on the CA²RE weekend as well as more general questions of research in the artistic and architectural fields.

The exhibition FORSK! was organised by Aarhus School of Architecture to coincide with CA²RE. The exhibition was the first joint public presentation of the research carried out by PhDs at Aarhus School of Architecture. The exhibition was actively used in some of the presentations at CA²RE and provided a physical frame for some of the joined discussions.

The CA²RE community is growing, and further conferences are already planned. The next host will be the Berlin Institute for Architecture of the Technische Universität Berlin, and the dates of the conference are 28 September-1 October 2018. Further conferences are also underway in University of Lisbon, Faculty of Architecture in March/April 2019, KU Leuven, Faculty of Architecture, Campus Sint-Lucas in September/October 2019, Glasgow School of Art, Mackintosh School of Architecture in March/April 2020, Milano, Politecnico di Milano, DAStU - Department of Architecture and Urban Studies in September/October 2020 and in Tallinn, Estonian Academy of Arts, Faculty of Architecture in March/April 2021.

Thank you to all of you who contributed to the Aarhus CA²RE Conference. Your engagement in sharing your research, thoughts and insights contributed significantly to create a generous environment for learning and exchanging ideas. I hope to see you and many new faces to the next CA²RE conference.

Welcome to Berlin in September 2018!

PROGRAMME

Friday 13 April 2018	Godsbanen
16:00-17.00	**Opening of the Research Exhibition FORSK!**
17:00-17.15	**Opening of the CA²RE Conference** *Claus Peder Pedersen*
17:30-18.15	**Booklaunch - Emerging Architectures, The Changing Shape of Architectural Practices** *Walter Unterrainer*
18:00-20.00	**Opening lecture by Siv Helene Stangeland, Helen & Hard Architects** *Introduced by Charlotte Bundgaard*
18:00-20.00	**Drinks**

Saturday 14 April 2018	Godsbanen, Kedlen	Godsbanen, Remisen	Godsbanen, Vogn 2
09:30-10:30	**Mathias Meldgaard** *TL (Chair), PP, AH*	**Angela Gigliotti** *TZ (Chair), ER, RZK, SLA*	**Corneel Cannaerts** *MB (chair), CB, IB, CPP*
10:30-11.30	**Petra Pferdmenges** *RC (Chair), ES, WU, BBK*	**Michael Wildmann** *JVDB (Chair), ER, IB, KM*	**Aileen Iverson** *CC (Chair), AKA, TZ, MJ*
11:30-12.30	**Hanne Van Reusel** *WU (Chair), RB, SLA, ER*	**Tomas Ooms** *CB (Chair), IB, CPP, MM*	**Jens Pedersen** *MB (Chair), TL, SS, CC*
12:30-13.30	**Lunch**		
13:30-14.30	**Eva Sollgruber** *AR (Chair), RB, TZ, KM*	**L. De Brabander** *CPP (Chair), SS, MM, BV*	**Agata Kycia** *CB (Chair), AKA, CC*
14:30-15.30	**Jingwen Shan** *ER (Chair), ES, RB, WU*	**Eva Beke** *CPP (Chair), MM, BBK, AKA*	**Jon Engholt** *MB (Chair), CC, BV*
15:30-16.00	**Break**		
16:00-17.00		**C. Carbone & A. Hardwick** *AH (Chair), RE, BBK, SS*	**Natalie Koerner** *TZ (Chair), AR, RB, CC*
17:00-18.00	**CA²RE - Meeting for the organisers**		
19:00	**Conference Dinner, Spiselauget, Godsbanen**		

Sunday 15 April 2018	Godsbanen, Kedlen	Godsbanen, Remisen	Godsbanen, Vogn 2
09:30-10:30	**A. Graça & A.Paio** *WU (Chair),RC, MJ, PP*	**Riet Eeckhout** *MB (Chair), BBK, CPP, MM*	**Vito Quadrato** *IB (Chair), CB, RZK, BV*
10:30-11.30	**Aurelie De Smet** *KM (Chair), RC, WU, ES*	**Viktorija Bogdanova** *CB (Chair), TL, RE, KO*	**Karianne Halse** *JVDB (Chair), ER, MJ, AH*
11:30-12.30	**Caroline Claus** *RC (Chair), AR, RZK, KO*	**Charlotte Erckrath** *AH (Chair), RE, MM, CPP*	**Udo Garritzmann** *IB (Chair), TZ, ER, MB*
12:30-13.30	**Lunch**		
13:30-14.30	**Masha Hupalo** *RC (Chair), KM, TL, MJ*	**John McLaughlin** *CB (Chair) , TI, RE, KO*	**Joachym, Williams, Rice & Sara** *WU (Chair), PP, TZ, AR*
14:30-15.30	**Helmersen & Silberberger** *TZ (Chair), PP, ER, WU*	**Ricardo Senos** *KM (Chair), AH, AR, CPP*	
15:30-17.00	**Plenary Session & Drinks**		

Monday 16 April 2018	Arkitektskolen Aarhus - Laden Nord
10:00-12:00	**Research Methods Training, Supervisory and Evaluator' Training - "Relevance of Architectural Research Training"**
12:00-12.30	**Conference Reflection Summary**
12:30-13.30	**Lunch**

Panels: Ruth Baumeister (RB), Jo Van Den Berghe (JVDB), Ignacio Borrego (IB), Boštjan Botas Kenda (BBK), Charlotte Bundgaard (CB), Roberto Cavallo (RC), Corneel Cannaert (CC), Riet Eeckhout (RE), Matthias Ballestrem (MB), Arnaud Hendrickx (AH), Matevž Juvancic (MJ), Anders Kruse Aagaard (AKA), Thierry Lagrange (TL), Sara Lusic-Alavanja (SLA), Kevin McCartney (KM), Michael McGarry (MM), Karen Olesen (KO), Claus Peder Pedersen (CPP), Petra Pferdmenges (PP), Alessandro Rocca (AR), Edite Rosa (ER), Sašo Sedlacek (SS), Eli Støa (ES), Walter Unterrainer (WU) Boštjan Vuga (BV), Rok Zgalin Kobe (RZK), Tadeja Zupancic (TZ)

RETHINKING TOURISM IN A COASTAL CITY
DESIGN INTERVENTION AS METHOD FOR UNDERSTANDING, REFRAMING AND REDESIGNING

MATHIAS MELDGAARD

Rethinking Tourism in a Coastal Town – Engaging through design-experiments
UNDERSTANDING, REFRAMING AND REDESIGNING[1]

Meldgaard, Mathias, Ph.D. fellow, Aarhus School of Architecture, Denmark

1. ABSTRACT

The paper presents the overall approach and initial findings developed through the first 2 years of work by a research group at the Aarhus School of Architecture (AAA) working on developing transformative site-specific architectural strategies for a renewed tourism-dominated landscape in the municipality of Ringkøbing-Skjern (RKSK) at the western coast of Denmark. The research presented is a part of a larger 3 year research project done in an interdisciplinary group with researchers from Aarhus University (AU) in collaboration with the local municipality. The ability of architecture and physical design-interventions to both engage with and spark local collaborations and strategic development are at the heart of the project. Overall, the aimed at research contribution is to investigate the potential of architecture to become at the same time a catalyst for tourism as well as for the enhancement of everyday life-experiences, when using a strategic design-based approach. The project departs theoretically from the idea that tourism is a part of and entangled with everyday life in a hybrid urban network. Secondarily the objective of the project is to discuss how mapping and 1:1 tests of spatial urban prototypes can be an appropriate way for research to both understand, learn from and impact small tourism-dominated towns.

Keywords:Coastal town, Denmark, Tourist gaze, research-by-design, design-experiments

2. INTRODUCTION

The project is situated in the paradoxical situation of Ringkøbing Skjerns coastal territory. Here we experience two opposing trends. 1) Stagnating economy and loss of population and workplaces as result of the general polarization going on in Denmark where people move towards the major cities. In this context, the territory is often negatively described as Udkants Danmark (Peripheral Denmark). 2) A large, and increasing, interests for the coastal territory as a tourist destination, hence a substantial seasonal exposure of local culture and landscape, and a temporary manifold increase of population (3.3 mio. annual tourists in RKSK). In this context, the territory is often described positively as Vandkants Danmark (Waterfront Denmark). This reciprocal growth trend gives a substantial significance to the tourist sector in the region, and in this context we find it relevant to reintroduce Gregory Ashworth question: *Which Urban Problems are you trying to solve with Tourism? (Ashworth 2009)*

Hvide Sande (White Sands) is a key location in RKSK, holding the lock between the North Sea and Ringkøbing Fjord. As such, Hvide Sande forms an active port in the Danish west-coast region,

[1] This paper is based on a prior conference paper co-written with Tom Nielsen and Jens Christian Pasgaard. Feb 2018

traditionally living of fishing and farming. Also, it has for decades been a prime tourist destination due to its wide white beaches and coastal landscape. This landscape is in a Danish discourse often perceived as the last and most pristine example of 'nature'. Here written in quotations marks since it is clear that the landscape has been undergoing urbanization for a century, mainly for industrial and touristic purposes, dotted with an almost continuous structure of summer cottages.



At present, in Hvide Sande, the driving transformative forces for development are tourism-related investments and the continued, but changed, industrial use of the natural resources (wind farming and fishing). Often these two driving forces are perceived to conflict. An example is off-shore windmill farms changing the horizon and view from the beach and the summerhouses. The interest and outset of the research project, however, is to investigate positions beyond this dichotomy. By transgressing existing categories like tourist and local, urban and rural, natural and industrial, but looking into the restructuring processes of the physical territory from a broad initial mapping, the project group is looking deeper into the coastal town of Hvide Sande. This is done to investigate its potential based *on* and not *in spite* of this entanglement and easy dichotomy often used in both planning discussions, as well as in stereotypical tourist-oriented presentations of the site.

3. OBJECTIVES

The point of departure is the hypothesis that sustainable development of the urban coastal territory in RKSK must be established in a more complex dialogue between places, residents, tourists, and other actors, using what is already there and thinking broader in terms of what things brought in and developed is *doing* and can *do*. This raises the question of how to engage with, understand and describe the complex network of actors and secondly how this knowledge informs a sustainable future developlent.

Through an onsite Research by Design approach the project is investigating situations of negative and positive interference between the various actors in Hvide Sande. Practice-based design methods are applied to map, understand and engage with these situations and through a series of physical design-interventions, site-specific potentials are tested and discussed in an iterative knowledge production.

Architecture is not about how it fxxxing looks, but about what it fxxxing does (Tredje Natur, n.d.)

This rather provocative statement from Third Nature links to a very relevant discussion about the role of contemporary designers and architects and how to engage with the socio material network that

constitute the hybrid urban territory. The question *what does it do* opens a relatively new discussion in architectural theory, by departing in an interest of performativity. This is linked to the growing focus on Actor Network Theory (ANT) as approach to a relational concepts of the urban territory.

(M)y argument is founded not on architecture as object, in which the visual presence often overwhelms critical thoughts, but rather on architecture as agency. (Till 2009: 146-147)

Tom Avermaete expands the notion of the urban territory as a network where the knowledge and skills of citizents are understood as immanent sources that are unlocked, activated and managed. In this case architecture and planning is no longer seen as an exclusicely professional matter, but rather as a case of commoning between different urban actors. By perceiving the urban environment as a network of ressources – human, build and natural ressources, we can considder architecture as an intervention whice holds the capacity to unlock some of these ressources. (Avermaete, 2016)

As such the project suggests taking advantage of mixing abovementioned driving transformative forces and hence to break with traditional destination planning, and destination branding, which still in Denmark is the way tourism development and also tourism research has its focus (Pasgaard 2012). The strategic purpose of such a maneuver is to create denser and more ambiguous coastal towns holding a greater programmatic complexity. This is relevant because Hvide Sande, just as many other towns and parts of the Danish coastal landscape, is also a place where people live. The desired outcome is coastal towns which are less negatively impacted by standardized tourist gazes and damaging seasonal fluctuation, and hence an exploration into how physical planning can support a more sustainable, integral and placebased development and growth in the tourist industry.

The main hypothesis is that architecture, when using a strategic design-based approach and applying it to an urban and programmatically as well as aesthetically muddled situation, can become a tool for mapping, understanding and activating abovementioned resources and hence a catalyst for a more integral tourism. This is possibly of great relevance within the small towns of the Danish coastal region, creating much more value for money on the tourism investment than when they are developed in a more limited and seclude landscape setting.

4. METHODOLOGY AND THEORETICAL FRAMING

The project is developed in an inductive and explorative way, driven by a practice based approach. From an initial stage of the research it has been the intension to let the research practice evolve continuously rather than deductively apply to a defined methodology. This approach is inspired by the research paradigm Research by Design (Verbeke 2013) in the sense that the architectural practice is the primary driver used to generate insight, understanding and knowledge.

The project draws on a literature review for establishing its state-of-the-art baseline. The research draws on different theoretical insights and literatures: First of all the discussion of ‘the tourist gaze’

(Urry and Larsen 2011) and how this perspective can inform the perceived conflicts and polarization between the two transformative drivers of the town: Tourism and its drive towards 'authentic' landscapes versus the industrial gaze looking at the landscape as a natural resource that can be harvested. This leads to a discussion of performativity (Kiib 2010) and affordance (Gibson 1979) of the urban environment, and how this is affected by gazes.

Secondly, the above mentioned approach to a physical context is based in a relational concept of place drawing on Healey (2007), Hvattums work on 'the tyranny of place' (Hvattum 2010) as well as Tietjen (2011) who has developed a relational concept of space-based in mappings and design experiments in Northern Jutland, also drawing on ANT. This opens for a hybrid understanding of the urban territory, more specifically how sites of everyday functions are entangled with sites of for instance touristic consumption, and how 'urban' is entangled with 'landscape' and 'nature'. (Offner 2000, Sieverts 2003, Nielsen 2015).

The architectural discussion is linked to the 'gaze' discussion and follows on recent Scandinavian projects such as the National Tourist Routes in Norway[2] and the Danish campaign Stedet Tæller (Place matters)[3] with their site-specific architecture. The question is how such place-based and design-oriented strategies apply in an urban and thus more culturally coded, programmatically diverse and layered context. Moving beyond architecture of the eye, and of the privileged and detached position in the landscape, to a more embedded and entangled one – moving from architecture as object towards architecture as agency.

The abovementioned discussions are continuously developed as a critical perspective and conceptual framework in dialogue with the site-specific design-actions. The mapping of the urbanized territory of Hvide Sande is using inspiration from James Corners idea of 'finding as founding' (Corner 1999), which defines mapping as a creative practice with the capacity or *agency* to *"uncover realities previously unseen or unimagined, even across seemingly exhausted grounds. Thus, mapping unfolds*

[2] The National Tourist Routes in Norway has been mentioned and discussed in numerous publications. See e.g. Haukeland (2011).

[3] 'Stedet tæller' is a campaign initiated by the member-based philanthropic organisation Realdania. For sepcific information about the campaign see: www.stedet-taeller.dk/ and for specific information on Realdania see: http://www.realdania.org. Accessed 2018-01-12.

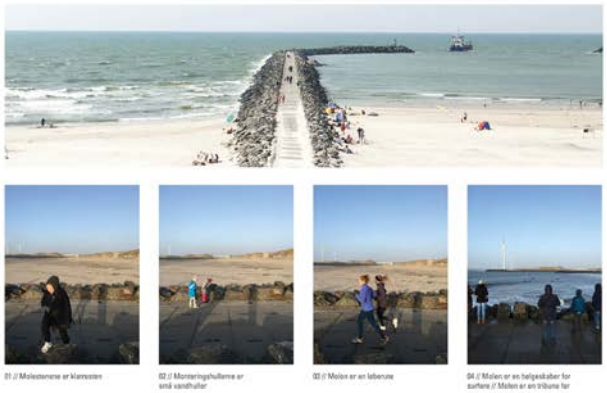
potential; it re-makes territory over and over again, each time with new and diverse consequences" (Corner 2014; 197).

Based on initial cartographic mapping exercises a series of urban situations are chosen for further in-depth studies. The sites are all placed in Hvide Sande, and furthermore revolve around the hybrid territory surrounding the harbor. The mapping points to a current programmatic separation between the northern industrial port, the tourist center south of the harbor, residential areas, local and tourism activities. It is the intention to investigate the possibilities for increased interaction between these areas and their users, and how this links to the strategic planning discussion - both spatial and experiential.

This process is seen as an extension and expansion of the preceding mapping process and introduction of a dialectic design-approach. Central to this phase is the development of a series of site-specific design-interventions that serves as pivoting point for dialogue with various actors.

The initial method for pinpointing the abovementioned situations of interest has been explorative field-studies; using walking (Schultz, 2014), photography and ad hoc meetings as perceptional mapping tools.

The substantial time spent in the field, and the large amount of empirical data collected, started to resonate with the theoretical framework and the discussion of how various gazes are affecting the urban environment. A specific focus towards the ambiguous reading of and engagement with the urban industrial environment in Hvide Sande started to develop a common ground for further investigation. That the industrial fishing harbor of Hvide Sande is perceived differently according to cultural gazes is obvious, but this finding initiates a discussion of the performative capacity of the urban environment (Samson, xxx), and how this is expanded when exposed to different gazes, as the two simple examples underneath illustrates; 1) the south pier, established as wave protection for the harbor and as such a piece of technical infrastructure but is simultaneously used by various other actors utilizing its affordances as wind cover, seating, promenade, tribune, playground, ect. 2) the harbor environment performs as both working space for the sailor and as a scene for spectating for the gazing couple.

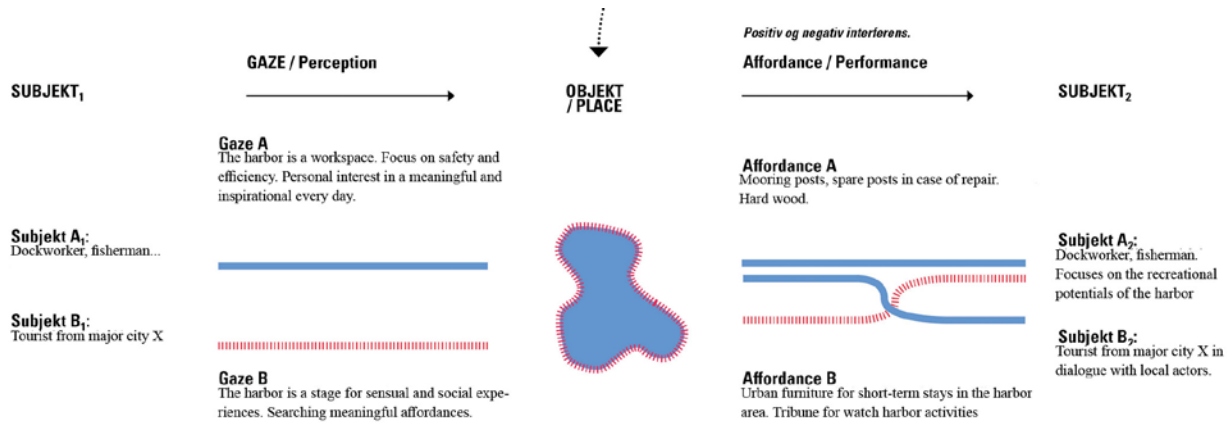


This focus raises a discussion of the concept of affordance (Gibson 1979). Affordances have to do with the meaningful action room that occurs between people and the environment, thereby being relational and dynamic. In Hvide Sandes complex actor landscape, where users' relationships with the area vary considerably, the affordance concept is particularly interesting to investigate. The various gazes of the area help to create environmental affordances, thereby enabling an experience full compassion.

This tentative finding of how the scope of action is expanded as a result of the gaze diversity of the area becomes a focal point for the development of site-specific interventions. This focus is developed and tested in dialogue with central actors and stakeholders related to the area.

The design-interventions can be seen as a series of disruptions or rearrangements of familiar situations, behaviors and places in the industrial area. Through simple design actions the intention is to activate hidden affordances and amplify alternative gazes, and hence initiate a broader discussion of the potential and conflicts when increasing interaction between actors. At the same time, the well-known distribution of roles between expert/layman and local/tourist is distorted and hence questioned. The design actions are related to Design Probes (Gaver 1999), Design interventions (Halse 2014) and Provotypes (Mogensen, 1992), in its attempt to generate novel qualitative insights and knowledge by reframing what is usually taken for granted.

Departing in abovementioned field observations and the tentative findings of the apparent relationship between various gazes and affordances of places, the diagram underneath was developed as a conceptual framework for the design-interventions: here the arrow pointing towards the object/place is seen as a design action disrupting or shifting the predominant affordance and hence impacting the gaze of the involved actors. The objective of such a maneuver is to facilitate a debate about meaningful positive interference by expanding the scope of places.



Five design-interventions have been conducted in five different sites of the harbor. The designs are tested and refined in an iterative process involving local stakeholders such as local industrial actors, the port authorities (main landowner in central Hvide Sand), the planning department, and tourist

Figur 1

actors. As the design-interventions are site-specific and mostly depart in rethinking, rearranging and redesigning existing elements and places, the process has been a constant negotiation with stakeholders uncovering the scope of action, interests, conflicts, competencies and opinions. This qualitative data has been documented in various formats (email, images, phone call, adhoc meetings, workshops, interviews) as it has unveiled gradually in unplanned situations.

Departing in abovementioned diagram, and for practical reasons, the design-interventions are mostly established through simple design moves; such as rearranging, adding and subtracting. The choice of medium has been eclectic and varied from drawing to model, renderings, diagrams, mockups and 1:1 installations.

On the following pages the iterative and dialectic design process is illustrated in two diagrams. Figure 02 gives a simplified overview of the progress of the design-interventions. As the project is shifting focus in the next phase, from dataproduction to analysis and reflextion, it is the intention to develop this diagram into an extensive projectmap showing the iterative design process of how respective designs has generated debate, engagement and insight, and thus mutated into new designs and new insights.

The present, figure 01 illustrates an extended line of action and events from design-experiment 03 Fjordharbor. In this case the simple act of illuminating some yarnpoles stacked for storage, by the local fishermen, led to a series of local interactions subsequently tentative findings: 1) a romantic/nostalgic gaze on the area and hence a rift for and against the ongoing transformation into a cottage area. 2) Strong reactions to the design, spanning from onsite discussions about the use, the balance between tourism and fishing ect. towards more physical reactions with the strongest manifistation being an alternative prototype coproduced by a group of neighbors.

5. CONCLUSION

Conclusions are only intermediate and partial since the project is still in development and the data generated from the design-experiments are yet to be processed.

The mappings and design experiments points to several preliminary conclusions: Firstly, the project's connection with a general Danish discussion

suggests a fundamental reflection or re-conceptualization of the issue of the tourism / local, culture / nature, work / experience and city / country dichotomies that much of the discussion of both tourism development and territorial development is linked to. The overall mapping of RKSK has shown a hybrid territory where many layers are written on top of each other through historical development. Here building on and negotiating differences between essentially opposing interests by being based on very specific site explorations (in a broad sense including actors both human and non-human) can provide new uses, new gazes and new collaborations. Findings from the design-experiments points towards the potential for a much wider scope of positive interference between actors in Hvide Sande.

Another preliminary conclusion, related to this, is that the design-experiments and thereby architecture and an architectural approach can be relevant as a way to open and make visible the complexities of the site in tourism dominated coastal towns. The research so far confirms that the more complex and layered situation requires long processes involving several stakeholders probably of a different kind and nature than in those projects arranging tourist gazes in more serene settings.

The work also shows that the approach and process in itself is of value to make visible the different gazes and interests in a site.

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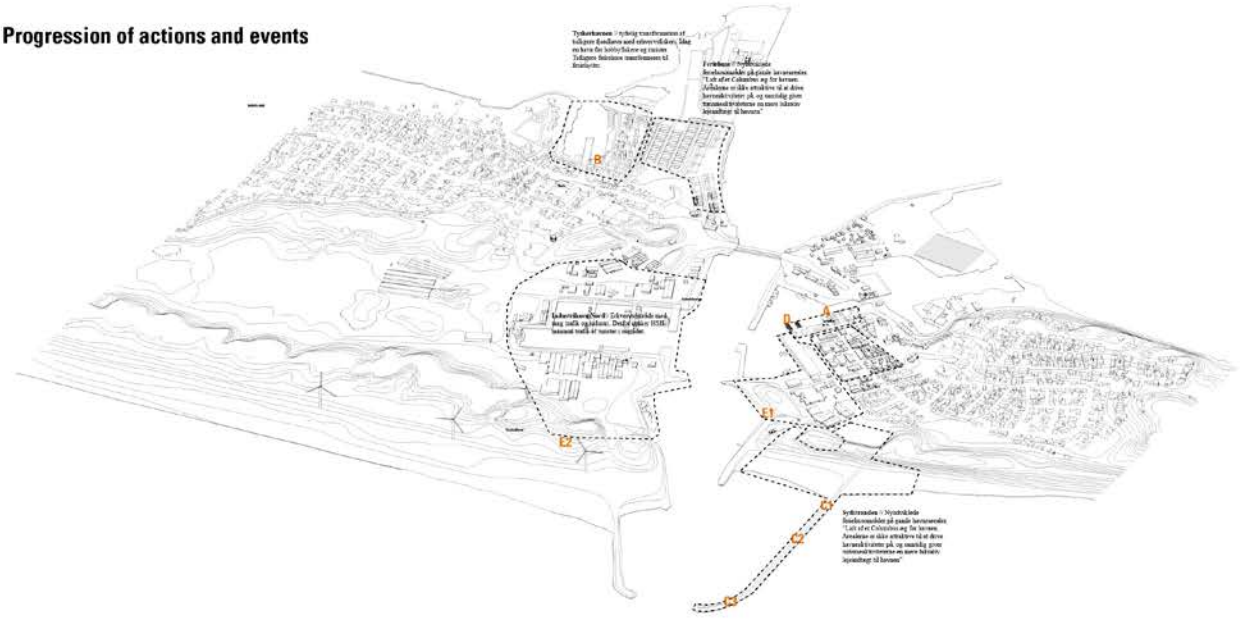
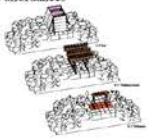
Progression of actions and events



01 // Southpier, staging the multiple affordances

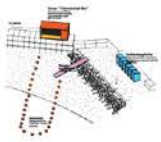


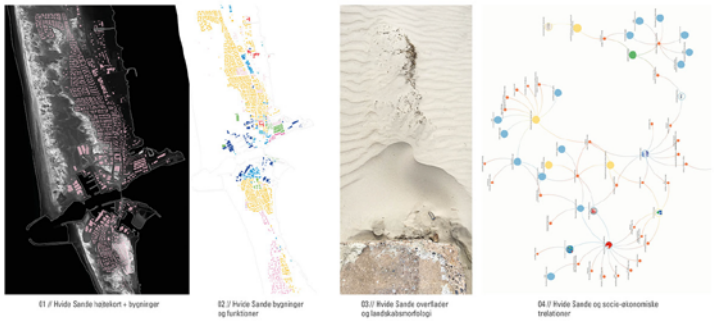
02 // Central quayside, rearranging stored harbor equipments, from parking to sitting.

03 // Fjordharbor, illuminating the ongoing transformation.

04 // Ice factory, reusing a redundant structure as comment to demolitionplans

05 // Hvide Sande Harbor, temporary harborbath.



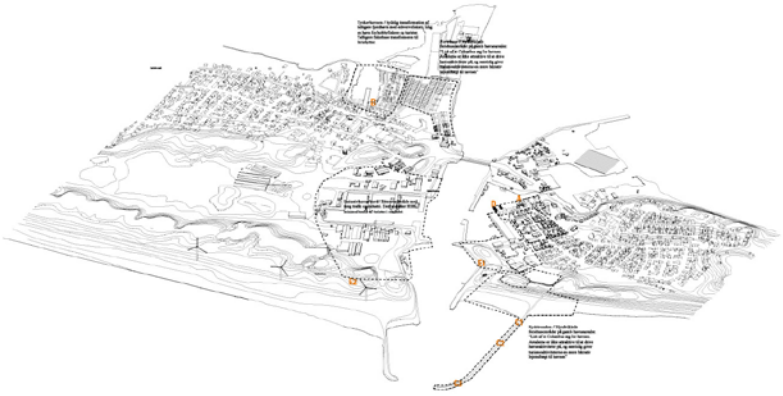


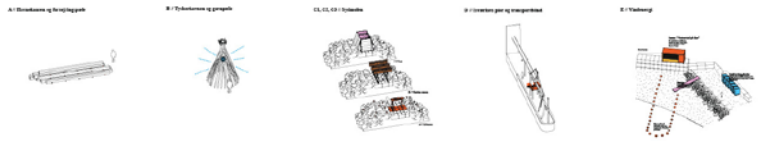
01 // Hvide Sande hatekort + bygninger

02 // Hvide Sande bygninger og funktioner

03 // Hvide Sande overflader og landskabsmorfologi

04 // Hvide Sande og socio-økonomiske relationer





Design-intervention process:

Large-scale topographic mapping exercises of the coastal territory of RKSK municipality. Focus on interference points between tourism and everyday

Zooming in on Hvide Sande. Field observations, onsite mapping exercise, and dialogue with local actors.
Selection of a series of urban situations for further investigation.

Development of site-specific design-interventions in dialogue with local stakeholders

Iterative and communicative designprocess

Onsite user observation and debate.
The physical design-interventions function as debate catalysts, generating site-specific knowledge from interacting actors.

Documenting the various interactions and position statements lead to an extensive catalog of site-specific knowledge. The list enables us to detect and describe cross-sectoral actor networks and hence substantiate a strategic focus on more entangled tourism development.

Reflection -> Design iteration + feedback to quality top-down planning processes

ALIVE ARCHITECTURE ACADEMY

PETRA PFERDMENGES

ALIVE ARCHITECTURE ACADEMY

Dr. Petra Pferdmenges

My ongoing research on inclusive urban transformation is nurtured on one side by projects of my urban design practice ALIVE ARCHITECTURE on the other side by my teaching practice at KU Leuven (Campus Sint-Lucas Brussels). As such, I am intending to bridge two worlds that are disconnected from each other: the one outside and and the one inside of academia. How is it possible to combine both practices, heading towards a joined model that I refer to as ALIVE ARCHITECTURE ACADEMY?

The current site of investigation is Brussels North. While until the 60's the district was a very lively neighborhood with cafés and a social life, later the area was transformed into an office district lacking any sense of belonging (Image 1 – 4). Today twenty percent of the buildings in the district are vacant (Image 5-8). The actors in the surroundings are diverse: There are many office workers moving daily from the north station to the towers, refugees that are spending their days in the next by Park Maximilian to ask for Asylum and the people interested in the topic of urban farming that engage in the farm Maximiliaan (Image 9-12). Currently the neighbourhood is experiencing a second life through multiple universities and practices that are occupying the WTC1. Since September 2017 we are contributing with students from KU Leuven (Campus Sint Lucas Brussels) to activate the World Trade Center 1 on the 24th floor (Image 13). To join the dynamics since January 2018 I moved my office ALIVE ARCHITECTURE in the same tower on the 26th floor (Image 14).

Each semester our students organize 1:1 interventions to generate Lived Space in the public realm of. In the BRU.S.L.XL Studio in the winter semester 2017/2018 the students from the Flemish Master initiated the encounter among actors from multiple backgrounds in the neighbourhood using food (Image 15). The International Master students in the summer semester 2017/2018 pointed out underused urban spaces in the surroundings (Images 17-20). In both semesters we organized the final presentation of students around the mobile device of ALIVE ARCHITECTURE, exhibiting the findings within the public realm to passers-by and local associations (Image 16, 20, 21 & 22). As such we are initiating collectively the encounter among actors from multiple backgrounds in the area, intending to contribute to an inclusive urban transformation process in the surroundings.

Teaching and practicing within the same building as well as using the mobile device of my practice within the final presentations of the students are first steps to overcome the border condition between academia and practice. Hopefully it is the seed for the emerging model of an academic practice that I am currently researching for: ALIVE ARCHITECTURE ACADEMY.

IMAGE 1
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – analysis of urban development
Source: Film du Studio BRU.S.L.XL – 0.12min

IMAGE 2
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – analysis of urban development
Source: Film du Studio BRU.S.L.XL – 0.16min

IMAGE 3
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – analysis of urban development
Source: Film du Studio BRU.S.L.XL – 0.20min

IMAGE 4
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – analysis of urban development
Source: Film du Studio BRU.S.L.XL –0.28min

IMAGE 5
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – Façade World Trace Center 1 & 2
Source: Film du Studio BRU.S.L.XL – 1.40min

IMAGE 6
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – Façade World Trace Center 1 & 2
Source: Film du Studio BRU.S.L.XL – 2.20min

IMAGE 7
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – underused Cafeteria inside of vacant World Trace Center 1
Source: Film du Studio BRU.S.L.XL – 2.00min

IMAGE 8
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – Inside of vacant World Trace Center 1
Source: Film du Studio BRU.S.L.XL – 1.53min

IMAGE 9
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – People moving out of Brussels North trainstation
Source: Film du Studio BRU.S.L.XL – 1.05min

IMAGE 10
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – Refugees search for Asylum
Source: Film du Studio BRU.S.L.XL – 2:52min

IMAGE 11
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – Maximiliaanfarm
Source: Film du Studio BRU.S.L.XL – 3:30min

IMAGE 12
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – People visiting Farm
Source: Film du Studio BRU.S.L.XL – 3:43min

IMAGE 13
Author: Nele Stragier
Info: Studio BRU.S.L.XL – Living North – Photo during studio in WTC1 – 24

IMAGE 14
Author: Nele Stragier
Info: Picture of Alive Architecture office space in WTC1 – 26

IMAGE 15
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – intervention in the public space around food
Source: Film du Studio BRU.S.L.XL – 5:25min

IMAGE 15
Author: Joris van Arkel
Info: Studio BRU.S.L.XL – Living North – intervention in the public space
Source: Film du Studio BRU.S.L.XL – 5:25min

IMAGE 16
Author: Alive Architecture
Info: Intervention in the public realm by the BRU.S.XL – Living North team

IMAGE 17
Author: Manhappen Studio team
Info: Manhappen Studio – communicating the history of the vacant blue house in the neighbourhood

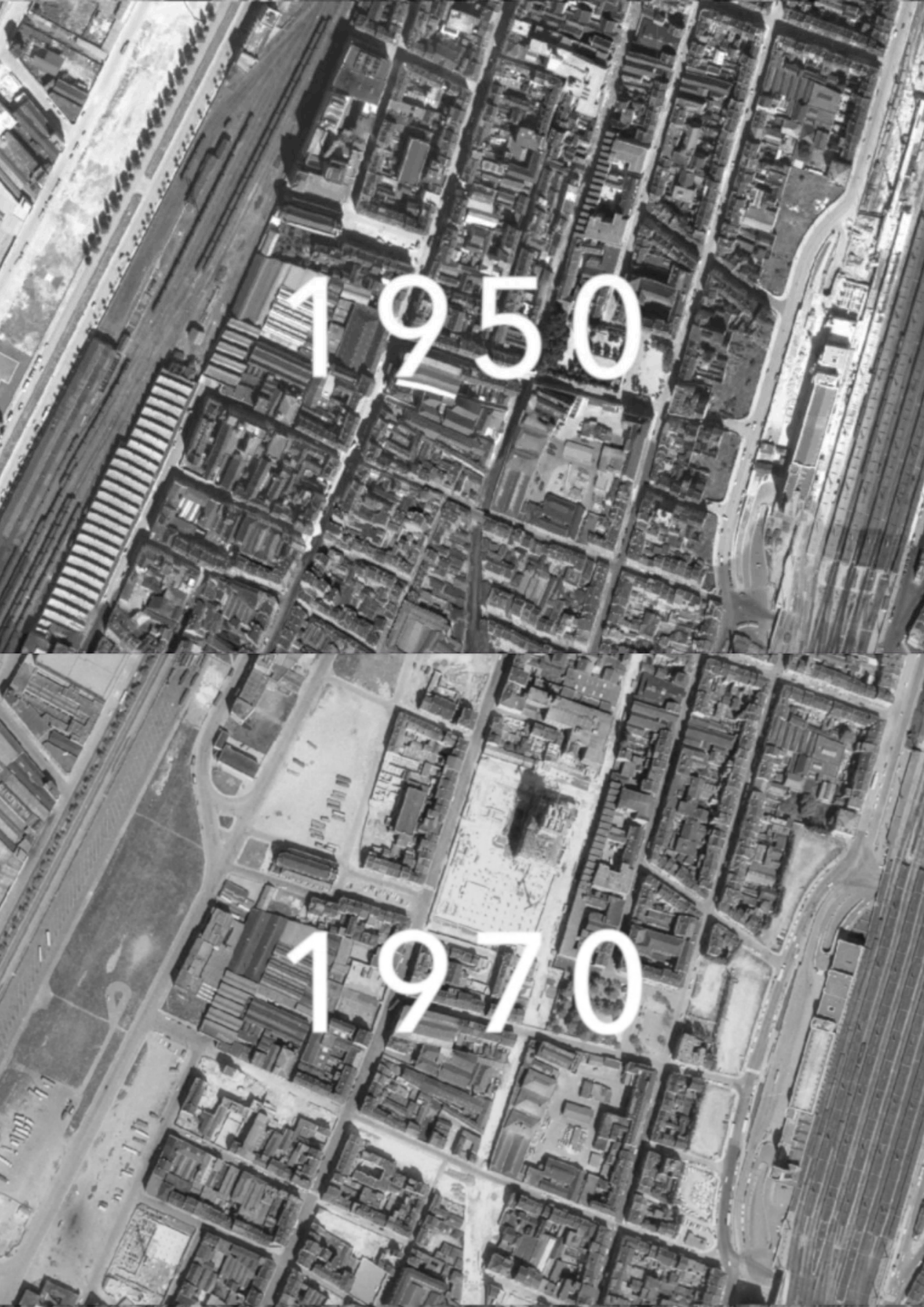
IMAGE 18
Author: Manhappen Studio team
Info: Manhappen Studio – drawing a base to engage with passers by to reveal a name for The place

IMAGE 19
Author: Manhappen Studio team
Info: Manhappen Studio – proposal to activate a green space that is unaccessible to the public

IMAGE 20
Author: Manhappen Studio team
Info: Inclusive Living North Studio – drawing a base to engage with passers by to reveal a name for The place

IMAGE 21
Author: Alive Architecture
Info: Final presentation of the students of the Manhappen Studio through a performance in the public realm

IMAGE 22
Author: Manhappen Studio
Info: Final presentation of the students of the Manhappen Studio through a performance in the public realm


1950
1970


1990
2018


Panineria


METTEZ VOUS À NOTRE Place
IRAKIEN + IRAKIEN = TERRORISTS
NOTRE RÊVE = VIVRE EN PAIX
L'IRAKIEN MERITE L'ASILE
LES IRAKIENS SONT EN DANGER
IRAAKSE KINDEREN=OOK KINDEREN
NOUS REVO
D'UN AVENI
MEILLEUR


Ferme
du Parc
Maximilien
asbl


Centre Pôle Nord
Centre Pôle Nord


DAN NE
İÇİN VAR?


DONNEZ UN NOM A CETTE PLACE
GEEF HET PLEIN EEN NAAM


RESTO
INDIEN
PHARMACIE - APOTHEEK

AN ENTANGLEMENT OF THINGS AND THOUGHTS

HANNE VAN REUSEL

An entanglement of things and thoughts:

A consideration of the relation between the written ground and visual narrative of a doctoral research and design practice

Hanne Van Reusel

PhD student Department of Architecture, KU Leuven, campus Sint-Lucas Brussels and Department of Architecture and Design, Politecnico di Torino

ABSTRACT

This paper discusses the content-graphical design of the things and thoughts that are entangled in my doctoral dissertation. The design-based action research in Urban Architectural Design (uAD) looks into how the field of uAD can contribute to the creation of urban commons. The dissertation orients toward four multifaceted contributions; (1) a critique on the contemporary practice of uAD and participatory design, (2) a display of the actions and interventions in the research and on-site, (3) a sensitivity to commonplace architecture, and (4) advocating a feminist attitude in uAD. Grounded in the experience in and around the Josaphat living lab in Brussels, these preliminary trigger a twofold compilation of the dissertation. A written ground will form the foundation and provides a linear reading that carries the reader from page to page through the elaborated arguments. In juxtaposition four (colored) visual narratives will each reveal, strengthen and question the targeted results. The written ground and visual narrative stand in dialogue to each other and aim to provide multiple and subjective ways of reading. A fragment of each is published in the paper and provide the discussion of the content-graphical design of the dissertation, for which the reader is invited to explore through her own reading.

KEY WORDS: Written ground - Visual narrative - Design-based action research – Brussels – Urban Architectural Design

Introduction

The paper will first provide a background on my doctoral research and design practice. The context, aim and methods of the research will be briefly discussed, after which the four multifaceted and preliminary results will be summarized. This reveals the entanglement of things and thoughts at stake in the doctoral work.

In the material and method section, the paper reveals the aspired content-graphical outcome of the dissertations and describes the positioning of the written ground and visual narrative in relation to inspirational references. A description will be given of how the design of the dissertation aims to underpin the results that are aspired.

To conclude in the results and discussion, an isolated fragment of the written ground and a part of a visual narrative will be published. The reader is invited to engage herself in the dialogic reading of these documents and the entangled relations between things and thoughts they are aimed to reveal.

A doctoral dissertation overlapping doctoral research and design practice // background

This paper will discuss the content-graphic outcome of my doctoral research and design practice at the Department of Architecture of the KU Leuven, Sint-Lucas Brussel (and the partnering Department of Architecture and Design at the Politecnico di Torino). This work is at the final stage of the doctoral program (40 months far), this paper targets to focus on the entanglement and juxtaposing of the "things and thoughts" (Veikos, 2013) that have emerged throughout the design-based action research.

The research and design practice look into the question on how the field of Urban Architectural Design (uAD) (Faculty of Architecture - KU Leuven - campus Sint-Lucas, 2012) can contribute to the creation of urban commons (Bollier & Helfrich, 2015; Commons Josaphat, 2015; Dellenbaugh, Kip, Bieniok, Müller, & Schwegmann, 2015; Ferguson, 2014; IASC, 2015; P2P Foundation & Transnational Institute, 2017; Burak Pak & Scheerlinck, 2015; Shareable, 2017; Van Reusel, De Clerck, Pak, & Verbeke, 2015), more specifically in the complex urban context of Brussels (Corijn & van de Ven, 2013; Doucet, 2015; B Pak & Verbeke, 2011; Van Reusel, Descheemaeker, Verbeke, & De Brant, 2017).

As architect-researcher-activist I (actively) engage in the temporary use of the Josaphat site in Brussels as living lab for my action research (De Smet & Van Reusel, 2017; Dick, 2000; Swann, 2002; Waterman, Tillen, Dickson, & de Koning, 2001) in the field of uAD. Engaging in a commons-oriented design practice, research by design (Servillo & Schreurs, 2013; Verbeke, 2013) is one of the conducted methods that provide the foundation for the preliminary results of the doctoral dissertation. Through the design-based action research, theory and practice have been approached as inextricable facets in relation to design (Gordon, 1949), which results in a dissertation that is entangled in the interwoven web of things and thoughts.

As the dissertation is in its final stage four multifaceted results are surfacing:
° IN CASE OF EMERGENCY (ICOE) - A critique on urban architectural and participatory design (red).
Through the generalized identities of economic man and modern architect, key concerns in contemporary uAD are addressed. Our cities are facing on-going commodification and commercialization of everyday livelihoods, an urban land grab, de-urbanization processes and increasingly wicked problems causing the field of uAD to struggle, while public actors are trapped in these neoliberal mechanisms. Through the specific case of Josaphat embedded in the Brussels situation, characteristics that conventionally are labelled as masculine dominate the urban development; both modern architect and economic man show to heavily thrive on a preference for rational logic, predictability, independence, dominance and self-interest. the developing field of participatory design is looked at as a potential way to tackle some of the challenges at stake. The opportunities offered by technical innovation seem to struggle with the similar challenges. The theory and practice evolving around the urban commons hint for an orientation to explore another type of uAD.

° MAKE YOUR OWN CITY (MYOC) - A synthesis / display / documentary of the research and its ground (green).
The current commoning paradigm -its theory and practices- offer a breeding ground to explore how uAD can contribute to the creation of urban commons. From my perspective as a researcher, the conducted methods of action research, research by design and the processes of coding and categorizing inspired by of Constructivist

Grounded Theory are discussed and illustrated. Exemplar and inspirational cases of commoning are pictured while a timeline unfolds the messy follow-up of interventions in the action research.

° COMMONPLACE ARCHITECTURE (CA) - Knowledge on and a sensitivity to commonplace architecture (yellow).
In collaboration with actors from backgrounds in architecture, anthropology, medicine, arts, communication, social work etc. I –as architect and activist- became part of inter- and transdisciplinary communities active on and around Josaphat. I / we are imagining, exploring and constructing urban commons through uAD interventions at micro scale within unasked for temporary use. The thesis focuses on tree key projects and their aspired coming together; they provide the ground for a discussion on what I bring together as "Commonplace Architecture" and its performative nature. The everyday and emotional experience of place, a sense of belonging, a strong relation to nature, horizontal organization, subjective reading of the city and an incremental transitional approach come together in a performance based visioning on the Josaphat site.

° A FEMINIST ATTITUDE (FA) - A manifesto for a feminist attitude in uAD (blue).
As (feminine) architect, I explore the multiplicity of roles, approaches and design strategies that I take on in the making of commonplace architecture. A clustering of adjectives such as relational, kind, imaginative, responsive, nuanced and attentive come together under the open container of "femininity". Through this wealth of adjectives the thesis manifests that uAD can be practiced otherwise and entails multiple ways of doing; a feminist stance offers a subjective position to confront the challenges connected to the masculine doctrine of modern architect.

Written ground and visual narratives // material and methods

A dissertation made up of a written ground and visual narratives

The targeted results of the doctoral research and design practice will come out in twofold. A written (academic) text will bring up the arguments and discussions of the work while four booklets will address the multifaceted results through visual and anecdotal evidence. Each booklet will have its own color connected to the contribution it is aimed to highlight; red for the critiques, green for the display of the design-based action research, orangey yellow for commonplace architecture and greenish blue for the feminist attitude. The textual base will, as foundation of the work, be represented in a soft grey.

The written text (grey) aims to explicitly and rigorously reveal the background, methods, discussion and results of the doctoral work. It provides the ground for the four additional booklets where the arguments are placed central. Inspired by the "Team 10 Primer" (Smithson, 1974) this part of the dissertation "*carries the message from page to page*" (Smithson, 1974, p. 1). This written ground playfully relates to the academic structure of a doctoral thesis and aspires to bring clarity, simplicity and accuracy to the reader.

The four colored booklets targets to compliment the written ground by providing visual an anecdotic arguments. They can be read as an illustration, yet they also bring up new and multiple understandings of what is elaborated on in text. In this regard each booklet makes up its own series of arguments which might sometimes even be conflicting with those written in clear wording.

This content-graphical design of the dissertation is inspired by Lina Bo Bardi's "Propeaedeutic Contribution" in which she proficiently made use of "visual evidence" to enrich her thesis. It was her ambition to have the texts, images and references work together to form a basis for discussion. The visual narrative provides alternative arguments, offering a non-linear reading, refusing to make a central point (Veikos, 2013).

Similarly the primer by Team 10 thickens its carrying text by other forms of expressions such as verbal illustrations, supplementary texts, footnotes, photos and drawings. These latter are made up by architectural plans and schemes (Smithson, 1974).

The colored booklets aspire to provide visual narratives that bring out a similar montage of diverse testimonies that offer an alternative reading. For this the dissertation will take advantage of the rich amount of data that has been collected throughout the design-based action research: photos of the interventions, notes from the architect-researcher, elements picked up in everyday conversations at the Josaphat site, video stills from media coverage or other types of documentations, fragments of publications on the interventions, schemes, imaginations, and other type of powerful images that relate to the discussion in the written ground.

The visual narrative does not aspire to be entirely comprehensible and through this paradoxically targets to reach out to publics that otherwise would not engage with academic research publications. By juxtaposing the written ground with visual narratives, the reader is encouraged to glance through to the various textual and visual arguments and can bring them together from her own reading. It is aspired to bring up a sense of the concerns which the doctoral dissertation aspires to put on the table.

Although the visual narratives and written ground are inextricably related, each element can stand on its own and be read separately. The five parts can be combined and shuffled as desired. In an open and interpretative way any reader –my peers on the field, students, fellow architects, academics at home in other disciplines, or a child- is encouraged to access this body of knowledge in their own scope. Like Bo Bardi I welcome the reader to act or maybe to have a pause and reflect.

Through this graphical design I target to also visually bring out a recognition for the entanglement of things and thoughts that is at stake in the doctoral research and design practice evolving around the creation of urban commons at Josaphat. Through this I also look to stress the strong relation between the design practice and the more theoretical approach of research.

A graphical design that strengthens its case

Not only the four visual narratives with their color code but also the way they communicate and give expression to their content aims to strengthen their case. As such, it is the ambitions that the graphical layout of the visual narratives support the four multifaceted results through which the doctoral research and design practice aims to contribute to the field of uAD.

00: The written ground (grey) as foundation to the arguments and targeted results, starts the numbering of its chapters and sections with “00”. The visual narratives will not get a number attributed to them but start their table of content with an abbreviation of their title; ICOE, MYOC, CA and FA. In this way also the organization and “numbering” of the diverse books aim to trigger the reader to order them according to their own interest and at pleasure.

ICOE: The (red) critical stance addressing some of the challenges of contemporary uAD and the masculine attitude of modern architect echoes in a manifest-like form of expression. Through the images and fragments of texts and data that will be incorporated, the compilation of the dissertation aims to bring out a strong and provocative visualization.

MYOC: The (green) display of the design-based action research offers a canvas to bring out the abundance of data and bring it together in all its messiness and complexity while the reader is offered a more clear contextualization in the written ground. Among other elements this booklet will document a timeline of actions and events and will bring out a visual image of the applied methods and the importance of the notebooks of the architect-researcher as form of documentation and base for the coding processes.

CA: The (yellowish) booklet on commonplace architecture will give an account of the design process of the three discussed key projects and their underlying processes of commoning. Mainly through photos, schemes, and the many forms of representation these projects encountered will be assembled and attempts to provide the reader with a sense of the atmosphere and enlivenment that comes with on-going co-creation of commonplace architecture at Josaphat

FA: The (blue) visual narrative will give expression to the multitude of feminine roles and attitudes the architect takes on as active partner in the creation of commonplace architecture. In this booklet place will be given to a photo exposition of one of the active commoners at Josaphat. The aim is to subtly offer multiple understandings and to subjectively highlight the otherness of the doctoral research and design practice.

A preliminary written/visual result of the content-graphical ambitions of the doctoral dissertation will be published in this paper as result and discussion. For this I have isolated a specific part from the written ground of the dissertation (in a draft version) and linked it to a couple of visualizations that are related to it.

The fragment of the written ground is part of chapter “00.04 A worrisome context” and contributes to the discussion on the background of the doctoral research and design practice. In the section “00.04.01 A sense of emergency” this specific fragment relates “economic man” to “modern architect” and discusses how they bound over certain characteristics that are traditionally attributed to the masculine. In its isolated form this fragment should be read as an illustration of how certain arguments of the written ground can be enforced –or challenged- by the visual narrative that juxtaposes it. It is not the ambition of the paper to discuss the specific content this fragment brings up.

In additional also the part of the visual narrative that will be published in this paper is an isolated part of the red “In case of emergency” booklet. This part of the visual narrative that I expose here will in the final dissertation also relate to other fragments of the written ground in the same way the provided fragment (in draft version) will be connecting to other parts that are brought up in the red and other visual narratives.

These preliminary results aim to bring out the discussion through their reading. As such, I will provide no further written discussion and allow for the written and visual content that is provided to speak for itself. I hope you, as reader will enjoy the dialogue that emerges through this juxtaposition of the given fragment of the written ground and part of the visual narrative.

00.04 A WORRISOME CONTEXT // background

00.04.01 A sense of emergency

f. Modern architect and economic man, two of a kind

Modern architect with his iconic products **and economic man seem two of the same kind**. Capitalist relations are after all reproduced through urban development (Petrescu & Trogal, 2017; Sassen, 2015). Their position in the field of economy or architecture and urbanism brings out a similar attitude to their profession and with that a - in their conceptualization crystallized perspective on society. Almost all renowned architects from the modern era are men* , which have been thriving of the support of others -often women- that today only start to gain recognition for their work (Heathcote, 2013; Keller, 2015; Ng, 2018). The personalities of economic man and modern architect illustrate a belief in the scientific and objective expert that is in control. In their resemblances they find a joint identity; he -yes both are men- is free and stands out as individual. Both position themselves in an attitude towards their discipline that is grounded in a world view that is made up by the sum of independent and free units. Like the homo economicus the heroic ideal of modern architect also is driven by a similar set of masculine characteristics that still today dominate the overall discourse in architecture.

Marçal's (2016) and Raworth's (2017) criticism on economic man can be extended to modern architect. Both figures our based on **a patriarchal dominance** of a certain portrait based on white men. They are attributed conventionally masculine characteristics, neglecting diversity, caring, the everyday, the emotional, kinship, nature, a cyclical approach and unpredictability. Indeed, all characteristics that are traditionally attributed to women.

* In the Taschen publication “Architectuur van de 20e eeuw” (Gössel & Leuthäuser, 2005), the bibliography part references to about 80 architectural practices from the 20th century. Most are represented by one leading male architect. Only four women are mentioned, always in relation to a male architect. This book was one of the readers for the history and theory course I followed during my studies in architecture.

* Rational logic: The expertise of modern architect is grounded in his technical intellect and mathematical efficiency. Modern family -in its standardized identity- had to live on a minimal surface with all the modern comfort at offer; a well-equipped kitchen, a hygienic bathroom and all other functions needed for living were to be provided. Yet, as housing was a critical need, minimal surfaces and space efficiency had to be aspired. A technical, competitive, rigorous, rational, economic attitude and on numbers based reasoning were set as the ideal for a world-conquering innovation in the fields of architecture and urbanism. Yet today it became clear some of these technical novelties -asbestos as well-known example- had unforeseen consequences (Gössel & Leuthäuser, 2005; Le Corbusier, 1925; Mumford, 2002).

Design is scientized following the obsession for objectivity and rationality. So eager to avoid randomness, modern architect opposed rules and regulations on his own work. Some of his most iconic embodiments, like Gerrit Rietveld were obsessed with form, looking to dematerialize the composition of planes and lines. Inspired by the novelties of machines; pragmatic, efficient and economic solutions were glorified. (Cross, 2001; Gössel & Leuthäuser, 2005; Heathcote, 2013; Le Corbusier, 1925; OpenLearn, 2001).

* Predictability: With the establishing of the urban planning discipline, master plans and functionalist zoning got embedded in legal and administrative terms (in Belgian the law on urbanism is founded in 1962). The blueprint -based on the objective and technical expertise of the designer- fixes the future of an urban development. An obsession grew around efficiency and control favoring tangible and predictable results. In Belgium, the task of the architect is legally defined as being the professional that is responsible for the design and the control of and assistance during the execution of the project until its delivery.

Public-private partnerships became a common practice that promises financial solidity and sufficient efficiency (Loeckx, 2015). Today -in

neoliberal times- modern architect has weakened but his contribution and achievements are still celebrated in the architectural education and general discourse (Gehl, 2015; Gössel & Leuthäuser, 2005). Quality can be guaranteed by playing out practitioners in competitions and government assignments still favor the cheapest offers while soil is sold to the highest bidders. Minimal and maximal surfaces for social housing are legally defined, as the amount of car parking spaces, width of the street... Most contemporary architecture practices are dealing with increasingly stricter regulations concerning energy efficiency leaving them with a cube as most desirable typology.

" Independence: Modern houses appear as white freestanding villas in the textbooks. In their artfulness they appear as sculptures without context, simply being a striking piece of work (Heathcote, 2013). The architect is a creative individual that is free and stands alone and aspires to realize the perfect and finished object (Rand, 1993). Architectural education finds itself in a culture of distancing, with dis-cussion as a driver for a more serious, competitive (even aggressive) stance to debate (Janssens, 2017).

In the field of urbanism the implementation of the "ville contemporaine" as it was massively tested in the development of postwar housing, illustrated that the ideals of equality, comfort for all, economic efficiency and functional organization had undesired effects. Especially as the oil crisis in 1973 caused the quality of the material and buildings to diminish and the public spaces around modernist housing became no-one's lands (Allemeersch, 2014; Ghenciulescu, 2015; One Architecture Week, 2016). There are numerous "renowned" examples of modernist housing blocks failing to create qualitative solutions for housing and public spaces; the Bijlmermeer (NL), Pruitt-Igoe (USA) and Trakiya in Plovdiv (BU) with in Belgium "Chicagoblokken" in Lokeren, "Rabottorens" in Ghent, North Neighborhood "Quartier blocs" in Brussels...

" Dominance: Modern architect in his practice and in education builds a new type of city with freestanding buildings in open parks of grass. Old studies about the what was a good habitat for homo sapiens were put aside by modern architect to design the dreamt environment for the new man. Everything should be different, the effect on the quality of life within the everyday was left out of the discussion (Gehl, 2015). Modern, and also postmodern architecture fail to take the needs of their users seriously, not interested in creating a sense of belonging (Doucet, 2015). The monolithic vision of modern architect has no interest in the local life of neighborhoods and ruled over the everyday enlivenment (Park, 2015).

" Self-interest: Designs are made more for the effect and photographic image than for everyday life. Comfort for the real life space often had to make place for sterile and neat results (Heathcote, 2013). The built architectural and urbanist innovations inspired by the modernist ideology of simplicity, objectivity and rationality could not always live up to the everyday complexities. Many of the reference projects -like the house in Brno by Mies van der Rohe or Le Corbusier's Villa Savoye- didn't welcome their inhabitants as the technical execution of the architect's innovative ideas weren't evident. Users complained about rain leaking through the flat roofs or draft winds making it impossible to have a comfortable rest. In general the success of modern architect got tempered by its expensive maintenance and the lacking comfort as due to insufficient acoustic insulation (Gössel & Leuthäuser, 2005).

In neoliberal times, the "starchitects" have risen and promote a culture of the spectacular. Landmark architecture -Bilbao- is a way to put a city back on the map within the global competition. Rem Koolhaas, an illustrative case of starchitecture -although trying to shake of this reputation- addresses himself that the starchitect has the image of "the asshole who doesn't care" (Heathcote, 2018).

Today, the doctrine of modern architect is not as strong as during its high days in the 20th century. Despite his noble ambitions, the outcomes of his work did not necessarily fulfill its ambitions (Gössel & Leuthäuser, 2005). In the words of the renowned architect Rem Koolhaas: "We became extensions of individual ambitions and lost credibility" (Heathcote, 2018). A shift is taking place that gives more space to modest architecture. This is strongly present in the Flemish architecture scene (Degerickx, 2012; Grafe & Contesse, 2016). Though, starchitecture is still hot and happening (in Belgium the Port House by Zaha Hadid Architects opened recently in 2016). Koolhaas is ready to rethink his own status as starchitect. He criticizes this superlative of modern architect when it comes to the spectacular and self-regarded stance. Koolhaas is ready to move on to the next happening thing; he sees a future in the 21st century that will move toward a post-human architecture. Function, data and engineering will define the design of the built. In this post-city, the human will almost become irrelevant (Heathcote, 2018).

An obsession with technicality and the objective, a freestanding attitude, and a superiority of the built over the human and nature still pair with a search for the next new thing and an eagerness to get grip on the future of the city seem still painstakingly actual in the field of uAD.

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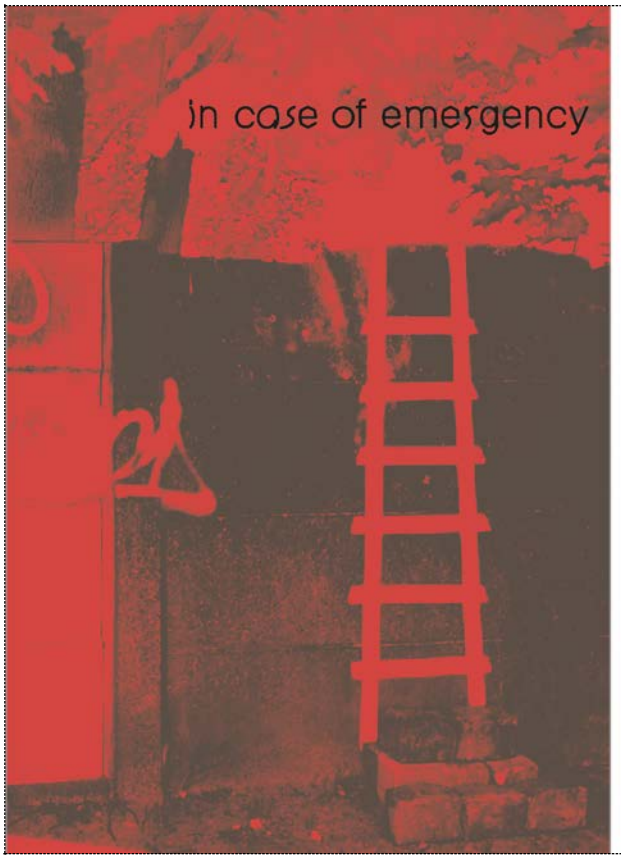

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You take my work as it is, or not at all.
THE ENRIGHT HOUSE
LUXURY APARTMENT BUILDING
Roark is a ruthless egoist who has destroyed Enright House for his own selfish motive.
No creator was counted by a desire to please his brothers
The creator requires independence, he neither serves no rules
It is an ancient conflict, it has another name: the individual against the collective.
The board of directors has chosen you as their architect.
We want you to adapt your building like this.
His work was his only goal, His work, not those who used it
The creators concern is the conquest of nature.
My ideas are my property !
What is your verdict? - Not guilty!


UW STAD IS VERKOCHT
TA VILLE EST VENDUE

Manhattan. Rits. Kwinten Gornay

Brüsel. Schuiten & Peeters.

Archibelge | OFFWORLD

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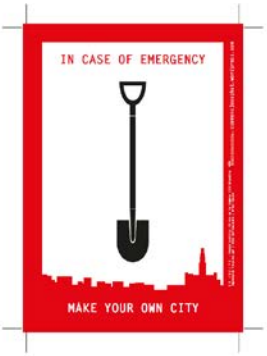
Josaphat site, Brussels. Photo by Paula Boufflioux, 2014.



Commons Josaphat

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GROSSFORM AND THE IDEA OF THE EUROPEAN CITY: A TYPOLOGICAL RESEARCH

EVA SOLLGRUBER

Grossform and the Idea of the European City: a Typological Research

Abstract

The following article is twofold. The first part examines the project 'The City in the City. Berlin: A Green Archipelago', a study on the urban condition of West Berlin presented by the German architect Oswald Mathias Ungers in 1977 and its underlying concept of 'Grossform' formulated by Ungers in the 1960s. Ungers' theories and projects illustrate a very specific notion of the European city and grant architecture a decisive role within city planning. This paper attempts to evaluate the implications of Ungers' theories on the idea of the contemporary European city. Given a proliferation of prominent, large-scale architectural projects in recent years the notion of Grossform formulated by Ungers provides an interesting contribution to the topic of the architectural category of size and on phenomena of current architectural practice.
The work of Ungers will be discussed in order to illustrate the underlying theory of the conducted research, which will be presented in the second part of the article. The second part discusses the applied research method 'research on design' and its challenges and sheds light on the research process.

Keywords: Architecture; Grossform; Archipelago City; Ungers; Research on Design

Introduction

'Because there is no theory of Bigness, we don't know what to do with it, we don't know where to put it, we don't know when to use it, we don't know how to plan it. Big mistakes are our only connection to Bigness.' [1: p.509f.]

This quote from the Dutch architect and thinker Rem Koolhaas is the point of departure for this research. In his text 'Bigness. Or the Problem of Large.' of 1994 Koolhaas tackles the challenges architects have to face when designing big building volumes with complex programs. In his opinion Bigness can be the driving force to establish a new spatial order in the city and to generate places of identity for its inhabitants.
When looking back in history large-scale architectural projects are a recurring phenomenon in architecture and city planning. Moreover today they play an important role in the development of cities and are a challenge for contemporary architectural practice. These buildings are *large* in scale, *hybrid* in program and *private* in financing. They are condemned by opinion in some parts of society and not infrequently by the discipline itself for their display of financial and political power within a globalized neoliberal system and for their apparent ignorance towards the existing fabric of the city. This criticism is a challenge the discipline has to deal with. But often architects themselves do not know what to do with these 'big' projects: how to talk about them, evaluate them and use their architectural and urbanistic potential for their designs, resulting in the denouncement of large-scale projects. This condemnation is often not based on a thorough analysis of the architectural project and its underlying concepts, however, but simply on biases. When facing the reality of having to deal with bigger building volumes and hybrid programs it is necessary to understand the architectural culture of this type of building:

'[…] contemporary architectural practice shows a limited interest in criticizing existing approaches. Yesterday's design projects are fully denounced not so much because their flaws have amply been demonstrated, nor because their hypotheses have proved to be false, but simply because they lost appeal due to the fact that a newer and more attractive rival appeared on the scene. This particular feature prevents contemporary architectural culture of accumulating a certain body of critical

knowledge on how architectural projects are conceived, how they are realized and how they perform within reality.' [2: p.223]

In this regard, it is important to have an 'in-depth understanding of the stock of historical solutions in order to define new models, systems and approaches' [ibid.: p.216] for contemporary practice.
Grossform is very often linked to monumentality and its political implications. It is stigmatized due to its instrumentalization by totalitarian regimes of the past and is exploited in the contemporary world for a capitalist demonstration of power. But despite these negative connotations of large-scale projects architectural categories like 'form' or 'size' depict fundamental architectural themes, which stimulated fascinating and fruitful discussions in the 20th century on the relation of proportion and aesthetics or of the architectural object, city planning and their social implications. One of these contributions emerged in Germany in the 1960s with Oswald Mathias Ungers at its center; a German architect who provided an important contribution to the topic of architectural size with his concept of Grossform. Ungers' reflections on this building type had an enormous influence on his idea of the city and the role he granted architecture within city planning. Ungers' thinking is deeply rooted in a European tradition and notion of the city and advances in dealing with European projects. The concept of Grossform has to be understood in the context of a European understanding of urbanity and civic life. The research presented here thus focuses on the European context of designing hybrid large-scale architectural projects.
But before discussing Ungers' approaches and the topic of Grossform it is important to state that the research focuses primarily on architectural issues. It is not about exploring the social, economic or political structures that underlie the realization of large-scale buildings today; the research is about discussing and understanding *architectural* issues for the purpose of advancing *architectural* knowledge. In this regard the research refers to the concept of 'relative autonomy' introduced by the French philosopher Louis Althusser in his essay 'Ideology and Ideological State Apparatuses (Notes Towards an Investigation) [3] from 1970. With this theory Althusser described the relationship between the 'superstructure' of society – including the State, ideology and culture – and the economic 'base': 'Relative autonomy signifies that none of these realms can be strictly reduced to the others – or strictly determined by the others.' [4: p.31] With this in mind, the cultural realm, including architecture, is not understood as the pure expression of the social, political or economic conditions from which it materializes. It is structurally connected to these realms but at the same time, however, it develops according to internal and autonomous logics and rules. The research focuses on these internal logics. The work of Ungers is paradigmatic for this complexity of architectural practice, yet the notion of the autonomy of architecture is prevalent in his projects and writing.

The Archipelago City

In 1977 a small booklet was published with the title 'Die Stadt in der Stadt. Berlin das grüne Stadtarchipel' [5, 6][1] presented by Oswald Mathias Ungers who was supported by a group of young architects namely Rem Koolhaas, Peter Riemann, Hans Kollhoff, and Arthur Ovaska[2]. The manifesto[3] focused on post-war West Berlin and its urban condition: unable to shrink due its fixed surface defined by the Berlin Wall while at the same time facing an enormous depopulation. The team formulated and illustrated a future scenario for Berlin based on 11 theses and 'two diametrically opposed actions' [8: p. 200]: reinforcing existing parts of the city and thereby reducing it to concentrated points, city-islands, while at the same time demolishing zones of the city which have been abandoned thereby

[1] 'Cities within the City' was first published 1977 in German only. It was published one year later in Italian and English (slightly reworked) in *Lotus International* No. 19 bringing it to a broader audience.
[2] In their book Florian Hertweck and Sébastien Marot [7] tried to shed light on the mutual influence of the people involved, in particular Rem Koolhaas' exchange with Ungers and his impact on the final text.
[3] Despite its low-key format and low dissemination at the time of publication 'Die Stadt in der Stadt. Berlin das grüne Stadtarchipel' can be seen in the tradition of influential manifestos of its era, such as: *Learning from Las Vegas* (1972) by Venturi, Scott-Brown and Izenour, *Los Angeles: the Architecture of Four Ecologies* (1971) by Reyner Banham, *Collage City* (1978) by Colin Rowe, or *Delirious New York* (1978) by Rem Koolhaas. By analyzing the condition of a particular place or city these 'city-specific manifestos' [7: p.7] illustrated a particular approach towards urban planning.

composing an Archipelago City in which architectural islands float in a natural 'sea'. The selection of the existing districts was based on their morphological distinctiveness and on the urban concept they represent:

'The architectural and planning intentions for the future consist solely in enucleating the true configuration of each urban island on the basis of which it was first chosen. It is essentially a matter of establishing, in a way, the "physiognomy" of that part of the city in question, and leaving one's own stamp on it to such an extent that it finds its proper expression.' [7: p.94]

The selection was not based on economic criteria but rather on the notion that these districts formed the 'cornerstones of the symbolic geography of the city' [9: p.223]. Ungers and his team produced morphological sequences illustrating the development of the selected districts into architectural islands. (**Fig. 1**)

Figure 1: Morphological sequence of the 'Cathedral district' of Friedenau: aerial photo, plan, building structure, island, analogy (Image: Oswald Mathias Ungers [7: p.54f.]).

In accordance with the existing morphological structure of a district certain characteristics were emphasized by design interventions and supported by images and analogies, thereby creating architectural islands, which can be understood as structures of Grossform.
In contrast to these distinct islands the substrate of the area between them was based on monotony: parks, woods, agriculture, and urban phenomena of the globalized age such as suburban housing zones, highways, supermarkets, shopping malls, airports, drive-in cinemas, amusement parks, and industrial buildings shaped the grid which held the individual islands together. This generic grid, which stands in opposition and confrontation to the defined architectural islands, embodied the urbanized areas of European cities.
Using this image of a fragmented city Ungers and his team formulated an unprecedented view of the European city and evoked new lines of thinking about urban planning. The approach reversed commonly used urban planning methods focusing on unifying the city – until this date – and promoted a pluralist system. The concept of the Archipelago City appreciates the ambiguity of the modern European metropolis, which is coined by a congestion of different, divergent and dichotomous principals, and acknowledges 'the pluralism of an individualized society without giving up the idea that a larger cohesive framework is possible' [10: p.18]. It is not about creating a unit, but about separating the city into sectors, districts, with architecture as their symbolic core. These islands stand out from the rest of the urbanized field 'by their quality and collective distinctiveness' [7: p.100] and constitute urban spaces of identity for each district and its inhabitants. Architecture is the departure for developing spaces of identity within the urban realm. It is the architectural form that brings spatial order and hierarchy to the sprawling urbanized areas of our cities. This approach towards urban planning, which is based on a negotiation between architecture and the city, is rooted in Ungers' thinking about the concept of Grossform, which he formulated 11 years prior to the manifesto, in 1966. [11]

Grossform: Elevating Architecture

Again in a small booklet with the title 'Grossformen im Wohnungsbau'[4], which was based on a lecture series held in Russia in autumn 1966[5], Ungers presented his thoughts on future forms of urban living and reflected on his experiences as a practicing architect. By gathering a selection of well-known projects, from mass housing to urban planning projects, Ungers discussed the essential principals of the concept of Grossform and formulated four criteria defining this building type:

- 'the existence of an over-accentuated element,
- the existence of an additional binding element,
- the existence of figure and theme,
- the existence of a system or an ordering principle.' [11: p.6f.]

These propositions are illustrated by a selection of projects, which can be understood as metaphors or analogies for the concept of Grossform, a tool of designing and thinking, which Ungers liked to use in his projects. In contrast to a general understanding of the term 'Grossform', Ungers' idea on this concept did not refer only to large-scale projects, but primarily to the definition of a strong architectural form:

'Only if a new quality is added to the sum of the individual parts and a higher level of development is achieved, can a Grossform emerge. Numerical size is not important. A house small in volume may equally well be a Grossform as a block of houses, a district or an entire city.'[6] [11: p.5]

Ungers illustrated his thinking with the Villa Malaparte built in 1937 by Italian architect Adalberto Libera: On the one hand the staircase fulfils the function of connecting two levels – the ground floor of the house and the roof terrace – but at the same time its shape defines the entire building. The house is perceived as a staircase. The staircase makes a leap in scale thus defining the shape of the building and determining it as a Grossform.
At the same time Ungers' starting point for the concept of Grossform was quantity[7]. The category of 'size' cannot be neglected, especially when facing the challenge of designing mass housing as in the 1960s. Ungers was thus of the opinion that it was essential to combine building volumes and design in a large scale. In his text 'Form in der Großstadt' [13] published one year later, in 1967, on the project 'Ruhwald' Ungers summarized this argumentation as follows:

'Megaform is, in terms of reality, more important than single-unit form. Concepts such as living wall, living carpet, living funnel, living hill and living panel contain larger connections and at the same time characterize categories of a new approach to imagination in design. […] It has been proven that quantities generate new qualities.' [14: p.6]

In his opinion the reality of the modern metropolis provoked decisions in design and urban planning that could not be solved by conventional design methods and tools: 'Both the concept of the house as a single autonomous work of art, and the concept of the city as an economically and socially self-sufficient unit are equally irrelevant to the problems we must face.' [14: p.5] For Ungers, Grossform was a possibility to think about design processes in architecture and urban planning in a new way.

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[4] It was printed in the series of publications 'Veröffentlichungen zur Architektur' (VzA), which Ungers produced during the time of his chair (Institut für Entwerfen VI) at the TU Berlin. Ungers published in total 27 VzA from 1965 to 1969, the year when he left the TU Berlin due to student revolts and was appointed professor at Cornell University in Ithaca.
[5] Ungers was invited by the Soviet Architects Association to Moscow, Odessa, Kiev and Leningrad to present his thoughts on architecture. [132: p.207]
[6] English translation by the author; original in German: 'Erst wenn zu der Summe von Einzelteilen eine neue Qualität hinzukommt und eine höhere Entwicklungsstufe erreicht wird, entsteht eine Grossform. Kennzeichnend ist nicht die numerische Größe. Ein im Volumen kleines Haus kann ebensogut eine Grossform sein wie ein Häuserblock, ein Stadtteil oder eine ganze Stadt.'
[7] In her essay ‚The Archipelago City: Piecing Together Collectivities' Lara Schrijver points out the ambiguity between the role of form and scale in Ungers' argumentation on Grossform. [9]

The closing comments on Grossform provided an outlook reaching towards the Archipelago City. Ungers described Grossform as the ordering frame within which 'unpredictable, unprojectable and lively processes'[8] [11: p. 29] take place, thereby understanding Grossform as a mediator 'between autonomous architecture and a participative development; between authoritarian and self-determined planning'[9]. [14: p. 45] In this sense, architecture gives form to and frames urban life. In the Archipelago City this frame was constituted by the grid, which held the individual islands in place and at the same time framed the urban activities, which took place within it. But also the architectural islands themselves can be understood as strong architectural forms, which frame urban life.
Ungers' thoughts on the concept of Grossform were particularly influenced by the book 'Die Architektonische Grossform' of 1957 [15] published by his teacher, the German architect Otto Ernst Schweizer. In regards of the growth of the modern European city of the 20th century, Schweizer considered the Grossform as a possibility to give the 'unrelated juxtaposition of the most varied forms'[10] [15: p.10] spatial order and hierarchy. Grossform is a possibility

'to architecturally frame the transformations of changing functions with a construction […], which is able to assert itself by its elastic adaptability against the volatility of modern life and its constantly evolving technology'[11] [15: p.8].

In this case, Grossform was perceived as an architectural concept that combines flexibility and adaptability with permanence and a strong architectural expression. The fact that a direct line of thought can be drawn between the considerations of Schweizer about the concept of Grossform and Ungers' City in the City released 20 years later becomes most evident when considering Schweizer's thoughts on the topic of city centers. Facing the expansion of European cities, Schweizer was of the opinion that the design of new city centers was the main task modern architects have to face. The developments of new urban areas are very often based solely on technical and economic premises. But in these new urban zones a 'human core' [15: p.148] respectively an architectural island needs to be developed. Large commercial, cultural and recreational centers with a distinct architectural expression could act as the backbone of new urban developments. These 'islands' within the 'inorganic expanded urban complexes'[12] [ibid.] restore the notion of identity and collectivity in urban space by creating manageable environments and places of engagement for the city's inhabitants while at the same time confining the seemingly infinite sprawl of cities. Grossform, whether as a residential building or a public civic center, could bring spatial order to the dissolving body of the city. Again, the strong form functions as a counterpoint to the amorphous urban sprawl.

Research 'on design'

Having set out the theory this research is based on the second part of this article will shed light on the ongoing research process and its challenges. No results can be presented at this point since the research is still at an early stage, but the introduction of the first considerations and actions taken can function as a basis for further discussion.
The aim of the research is to analyze large-scale projects on order to draw conclusions on possible implications for current architectural practice and urban planning. The research will focus on the one hand on the public or semi-public spaces created within large-scale architecture projects and on the other hand on the tools and methods needed for designing a Grossform. The latter is crucial for the

[8] English translation by the author; original in German: 'Die Grossform schafft den Rahmen […] für einen unvorhersehbaren, nicht planbaren, lebendigen Prozess'.
[9] English translation by the author; original in German: 'ein Vermittler zwischen autonomer Architektur und partizipativer Entwicklung, autoritärer und selbstbestimmter Planung'.
[10] English translation by the author; original in German: 'beziehungslosen Nebeneinander der verschiedenartigsten Formen'.
[11] English translation by the author; original in German: 'durch eine als Großform konzipierte Konstruktion den Verwandlungen wechselnder Zwecke ein architektonischer Rahmen gegeben werden kann, der gegenüber der Veränderlichkeit modernen Lebens mit seiner ständig sich entwickelten Technik durch seine elastische Anpassungsfähigkeit sich zu behaupten vermag'.
[12] English translation by the author; original in German: 'unorganisch ausgeweitete Stadtkomplexe'.

practice of architecture since 'the models for big building projects have rarely developed within the last one and a half centuries'[13] [16]. The understanding of possible underlying principles of the design of large-scale buildings could be an enormous advancement for the knowledge culture of architecture.
Furthermore the public space within a Grossform is an important topic to discuss. As mentioned earlier, large-scale projects are often criticized on the one hand for being symbols of the prevailing neo-liberal economic system because they are usually privately financed, thus creating rather 'private' – or 'semi-public' – than 'public' spaces within the city. On the other hand they are often perceived as isolated urban fragments with no connection to their context. But the question at hand is if these semi-public spaces within Grossform-projects do have a spatial and urban potential and can contribute to a positive development of a city. Moreover it is important to analyze the relations between these spaces within a large-scale project and the rest of the city. The research on the concept of Grossform could open up new perspectives on these pressing themes and furthermore on the notion of the city.

The investigation will be conducted with the research method focussed 'on design' meaning that selected projects will be analyzed trying to find new knowledge about these projects and thereby providing new perspectives on challenges the discipline has to face today. Referring to a paper by architect and academic Oya Atalay Franck [17][14] research 'on design' describes research done 'about designing or for the purpose of designing' [ibid: p.5] focusing 'on all kinds of aspects related to a specific design problem' [ibid.]. In this type of research, designed projects are the objects to be studied.
The analyses of selected projects will be conducted with the tools of architectural production – plans, diagrams, drawings etc. – 'as a means of describing, theorizing and explaining' [18: p.175] the issue thereby 'bringing the results of research closer to the design process' [ibid.]. Conducting research in the architectural field *on* architectural objects *by* architectural means one is constantly confronted with – as Nigel Cross described it in his famous text 'Designerly Ways of Knowing' [19] from 1982 – 'ill-defined' problems, which are a genuine part of the architectural culture of knowledge production:

'They are not the same as the "puzzles" that scientists, mathematicians and other scholars set themselves. They are not problems for which all the necessary information is, or ever can be, available to the problem-solver. They are therefore not susceptible to exhaustive analysis, and there can never be a guarantee that "correct" solutions can be found for them.' [ibid.: p.23f.]

For Cross this type of problems demand a very specific approach towards the problem-solving-process, which he described as 'designerly' and which characterizes a third area of knowledge production next to natural sciences and the humanities. Thus the research described here is not about finding the single correct solution – which does not exist in this type of research – but about raising questions and trying to illustrate possible considerations and making them shareable thereby enriching the 'body of critical knowledge' [3: p.223] of the discipline.
The next chapter will illustrate first attempts in investigating a project and thereby testing architectural research methods and techniques.

First Experiments

The first stage of the research was the start of an experiment with an unpredictable result: one project was selected to test different analysis methods and approaches. The experiment is still going on hence only the first actions taken can be shown here. Since there are (still) no specific criteria formulated for the selection of the projects to be investigated, taking Ungers' own selection of projects for his publication about Grossform as a reference appeared to be an obvious course. Furthermore two premises were formulated in order to confine the selection of possible projects: first, the project should be located in Europe and second, the project should be a hybrid combing a variety of public functions with housing. Simply by formulating these two premises the selection was narrowed down to a few

[13] English translation by the author; original in German: 'die Modelle für grosse Bauvorhaben [haben] sich kaum weiterentwickelt […] in den letzten anderthalb Jahrhunderten'.
[14] In this paper Atalay Franck formulates the distinction between research 'on design' and research 'by design'.

projects leading to the selection of the design of the Culture and Business Center for the Nordweststadt by Dutch architecture company Van den Broek en Bakema from 1961 (**Fig. 2**).

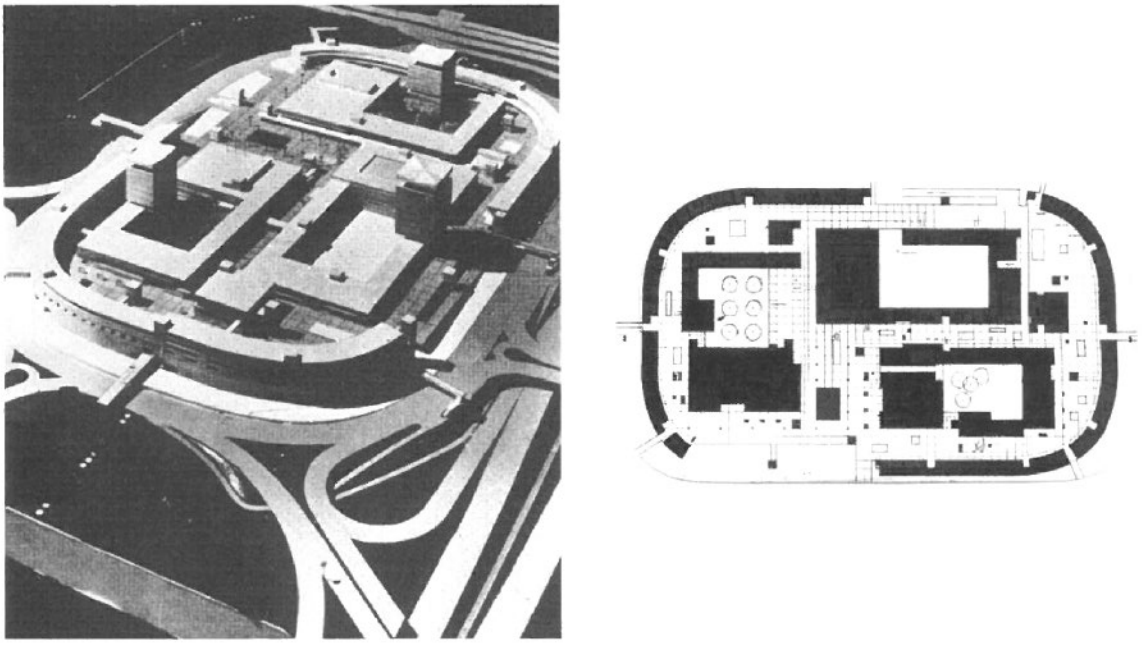

Figure 2: Culture and Business Center for the Nordweststadt by Van den Broek en Bakema (Image: extract of Ungers' 'Grossformen im Wohnungsbau' [11: p.20]; Collection Het Nieuwe Instituut/ BROX).

The design of the Culture and Business Center for the Nordweststadt in Frankfurt by Van den Broek en Bakema was submitted in the competition for the center of the Nordweststadt, an ambitious city development project by the Frankfurt City Council, which had been won by German architect Walter Schwagenscheidt two years earlier in 1959. The Culture and Business Center was conceived as the cultural and social center not only for the Nordweststadt but also for a larger catchment area of the suburbanized areas of the Northwest of the city of Frankfurt with an approximate total number of 80,000 inhabitants. [20] This center should not only be a traffic hub and shopping center, but a 'city crown' for the suburban area; an urban place, which provides a sense of identity and collectivity for the inhabitants.

Ungers used the project in his publication on Grossform to illustrate the concept of the 'closed block with inner courtyard' [11: p.21], a special form of the concept of the wall. The block 'offers a distinction between interior and exterior. The courtyard mediates as a semi-public space between the public free space and the private apartments.'[15] [ibid.] This semi-public space can be described as an 'urban interior' [20: p.202] or as a collective space for the people who live in this Grossform.

The first means in order to start to understand the project and its potentials was to re-draw the existing floor plan of the project. (**Fig. 3-4**). Despite its very literal nature, starting to re-draw the existing floor plan was the most feasible method for getting a grip on the project and being able to document first findings. Copying is a valuable method for understanding a project and its underlying principles. [18] To re-draw a project means interrogating it, trying to thoroughly understand it and examining its quality of composition, proportion, spatial qualities etc. While re-drawing the project the main principles of the design became more evident and were documented in the form of diagrams. (**Fig. 5)**

The re-drawing of the plan required a definition of parameters according to which the project will be drawn. What are the dimensions for the grid, the construction, etc.? The defining of certain specific data and facts is essential (**Fig. 6**), especially when working with plan material, which is not available

[15] English translation by the author; original in German: 'Er [der geschlossene Block] bietet eine Unterscheidung zwischen Innen- und Aussenraum. Der Innenhof schaltet sich als halböffentlicher Raum zwischen den öffentlichen Freiraum und die private Wohnung.'

digitally. This is a constant adjusting and searching process for reference points in the existing plan and in the descriptive texts about the project.

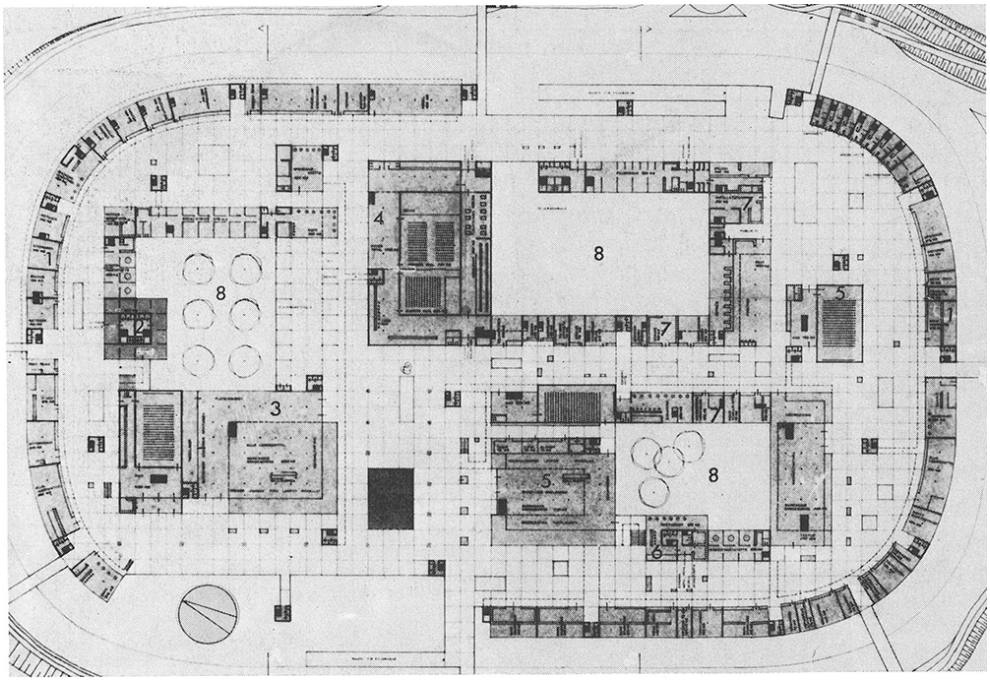

Figure 3: Floor plan of the design of the Culture and Business Center for the Nordwestadt by Van den Broek en Bakema (Image: Architectengemeeinschap van den Broek en Bakema [21: p.12]; Collection Het Nieuwe Instituut/ BROX).

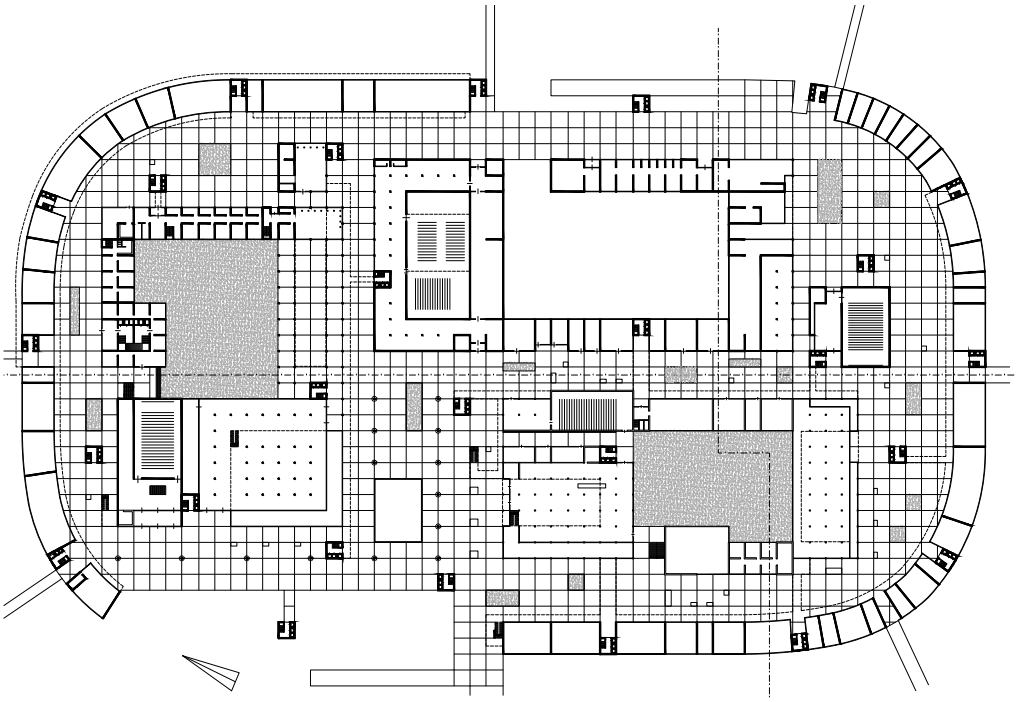

Figure 4: Re-drawn floor plan (Image: Eva Sollgruber).

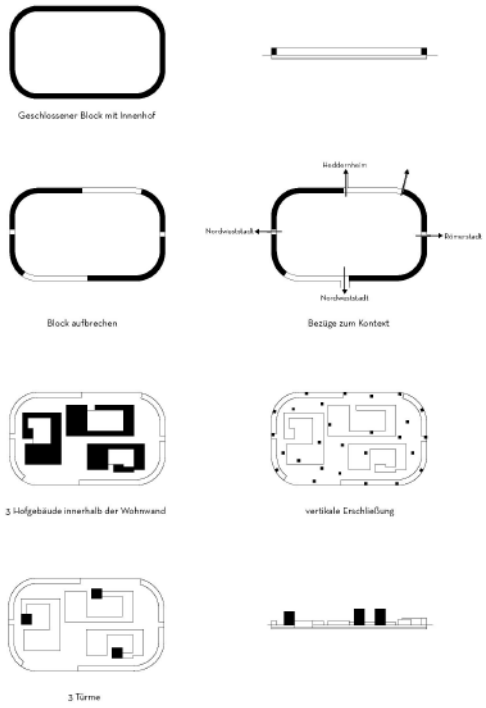

Figure 5: Diagrams explaining the main design principles of the project (Image: Eva Sollgruber).

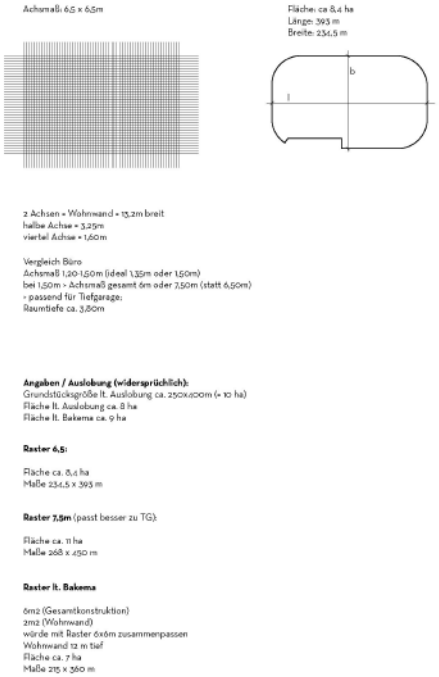

Figure 6: The 'fact sheet'; collected data about the project (Image: Eva Sollgruber).

It turned out that the act of re-drawing is an important basis for a further examination and thinking about the spatial qualities and characteristics of the project. It is neither necessary to re-draw the project in its complete form, nor is it possible to produce an accurate replica of the original project; the reproduced plan can only be an approximation of the actual design but it can be considered as the first stage of the researcher's reflection on the project in order to draw conclusions not only about the project in particular, but about the concept of Grossform in general. The overall objective of the research is the shareability of these conclusions and interpretations as also the externalization of the tacit knowledge that resides within the designed project. Each of the produced drawings at this point represents a different perspective on the project: the 'fact sheet' illustrates the numerical, the diagrams the systematic and the ground floor the typological aspects of the project. It will be necessary to develop these methods of investigation further in order to illustrate the researcher's conclusions and interpretations of the project and to utilize the creative and speculative potential of the tool of drawing. Moreover the selection of the projects analyzed will be a crucial step in defining the overall output and direction of the research.

Conclusion

The concept of the Grossform represents a specific approach towards urban design. For Ungers it demonstrated the possibility of uniting architectural *quantity* with architectural and urban *quality*. In the prospect of ever increasing building tasks, this question seems to be more relevant than ever.
The research discusses, evaluates and interprets large-scale projects in order to illustrate this specific theory of the city with the means of architecture. It is not about judging the quality of selected projects but about identifying their potentials for contributing to an ongoing debate within the discipline; it is about raising questions and using the 'critical capacity of the architectural project' [3: p.214] to comment on current developments and provide possible scenarios for new approaches towards design and urban planning. In order to be able to utilize this critical and speculative capacity of architecture in research, it is necessary to apply methods and produce material, which do justice to this potential.

Until this point the produced material of this research merely informs about the project. As mentioned above it is necessary to develop the applied research methods further and utilize its creative potential. Using architectural or even artistic methods as a tool of investigation offers the possibility of formulating statements *on a design* with the *methods of design*. There are no fixed rules or strategies for this type of research. The researcher is confronted with the question of how to utilize architectural methods within the field of research with every new project. The path of gaining knowledge is as unpredictable and complex as the process of architectural design itself. The relevance of this type of (PhD) research resides here, since it contributes to a further establishment of 'designerly ways' of knowledge production.

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CONTEMPORARY PUBLIC SPACE
A TOPOLOGICAL ANALYSIS METHOD

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CONTEMPORARY PUBLIC SPACE, A TOPOLOGICAL ANALYSIS METHOD

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Abstract

Along with the progressive building technology and massive urban transformation in contemporary times, the functional and formal requirements for urban spaces are changing as well. As a young branch of modern mathematics, topology has gradually penetrated into the architectural field. It breeds alternative thinking methods with a brand-new spatial dimension that makes it one of the heated trends in present urban projects. The article begins with the status quo of European cities particularly urban public spaces in the present day and then the elaboration of topology in urban spaces. Subsequently, the topological design method in urban spaces will be analyzed through actual cases, in block scale, architectural scale and urban scale respectively. Eventually, it comes to the summarization of topology as a physical and philosophic urban spaces design tool.

Keywords: topology; topological space; public spaces; city; scale

1. In the Era: Public Space as a Transitional Zone

Historical European cities have peculiar urban fabrics that unify buildings and blocks in a whole and compact environment. At the opposite, in contemporary cities, this character gets completely lost. Urban spaces are located among buildings of various scales and styles. One of the problematic issues of historical cities today is the visual and physical split between old and new urban fabrics. This article, based on a comparative analysis of case studies and on exercises of architectural and urban design, states that urban public spaces can play a pivotal role as transitional spaces between urban fragmentations belonging to different historical ages. Nowadays, pushed from the changes of contemporary architecture, urban spaces mutate their nature, such as squares grown in vertical direction and complex spaces articulated in multiple layers, often more integrated with the facades and interior space of the surrounding buildings. For instance, the recently built Piazza Gae Aulenti, in Milan, appears being wrapped into the building. Cantilever structure is now widely applied to modern architectures, which leave the ground floor open public spaces while upper floors building. Moreover, each floor plan of a contemporary architecture could shares different shapes and even positions. In this case, urban morphology is no longer comprehensive to analysis of urban design and public space, because it is not able to demonstrate vertical information. Then, the article is addressed to a series of selected public squares in Milan, analyzing construction timelines and regarding how their impact is, in reference with connecting the low-density areas with high-density ones, developing new relations among the surrounding buildings, exploiting new topological characters and potential qualities. Topology is not a realistic description of the existing place, but a possible opportunity.

2. Topology in Urban Public Space

Topology is concerned with the properties of space that are preserved under continuous deformations, such as stretching, crumpling and bending, but not tearing or gluing. [1] Therefore, in topology measures such as distance and angle are not important, but shapes, relative positions, and arrangements are. Topologically, two shapes are considered the same if one can be deformed to the other. For instance, a doughnut is the same as a coffee cup. Topology developed as a field of study out of geometry and set theory, through analysis of concepts such as space, dimension, and transformation. [2] In the 17th century, Gottfried Leibniz proposed geometria situs (Greek-Latin for "geometry of place") and analysis situs (Greek-Latin for "picking apart of place"). The notion of 'place' is evidently the root for topology. Since it was originally used to study the positional relationship between graphs, topology is also called 'geometry of Position'. It accidently matches up with de. Certeau's place theory. He defines the "place" as an "instantaneous configuration of positions".

Topological studies have shown that the shapes in reality are mostly orientable, including 2-dimensional planes, but there are also non-orientable ones. The Möbius strip discovered by the German mathematicians August Ferdinand Möbius and Johann Benedict has the mathematical property of being unorientable. It is a surface with only one side and only one boundary. [3] The discovery of Möbius strip makes the space more complex, and brings infinite imagination to urban public space design. As the French mathematician Poincaré described, topology as "the science that allows us to know the nature of geometric bodies that exist in space beyond the three-dimensional world"[4].

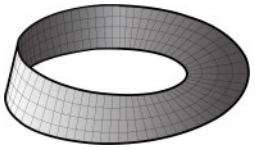

FIGURE 1.
Möbius Strip

Topology as a relatively new branch of mathematics has been used in many discipline fields. The birth of Leonhard Euler's Seven Bridges of Königsberg Problem brought up a heat among geographers around 60s and 70s of last century. By turning to topology in their research, they seek a mathematical language that could capture the shifting network of relationship. For architectural and urban design field, topology is referenced relatively late. Nevertheless, in contemporary architectural and urban design projects, design that takes deformation as a form and spatial tendency is becoming the mainstream of contemporary landmarks. Topology is becoming a theoretical support in the field of architectural and urban design by studying the characteristics of objects that remain unchanged under deformation. Continuously streamlined and curved spatial pattern is considered as a new styling of architecture and urban public space, such as Möbius strip air walkway, Klein Bottle Houses, Chinese National Aquatics Center "Water Cube" and so on.

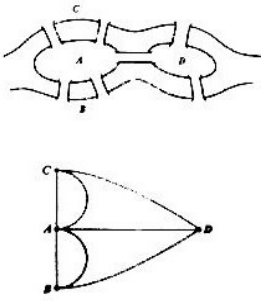

FIGURE 2.
Seven Bridges of Königsberg Problem

Topology breaks through the formal language of architecture under the constraints of Euclidean geometry and orthogonal Cartesian coordinate systems and inspires new patterns of spatial composition. It can be dedicated to the physical form and inner philosophy of architecture and urban spaces, creating a ground for fertile imaginations and possibilities.

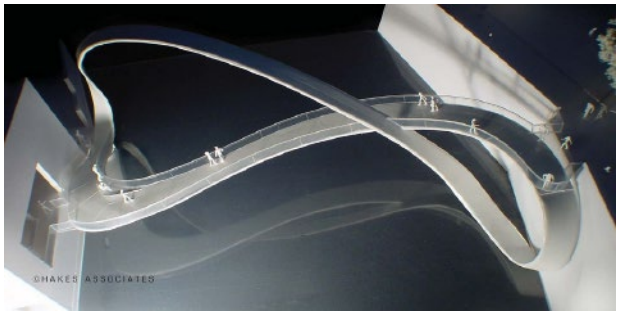

FIGURE 3.
Möbius Strip Air Walkway

FIGURE 4.
Klein Bottle House

3. Topology Applications in Multi-scale

Although there are still few iconic applications of topology in architectural field so far, analyzing urban spaces and transformations from a topological perspective is crucial to understand the nature, formation and pattern of space, since topology research is a qualitative research in nature rather than a quantitative one. It can identify possibilities or impossibility; assert existence or non-existence.

1) Block Scale, Micro-terrain

Topology captures objects at different times and collects them in the same space-time, forming a continuous 4-dimensional dynamic space model. Adding a time axis to the original Cartesian coordinate axes, the classic Euclidean space gets collapsed, compressed and stretched under the effect of time. We can imagine, for example, that after getting off from Milan central station, it takes 35 minutes by walking to get to the Cathedral of Milan, but only 7 minutes by subway. Then we can assume that the impression of the space on the high-speed subway is compressed. Following this logic, if we slow down the speed of passing through a place, the space will be stretched, at least in people's perception. This way limited land can be utilized more efficiently, especially in high-density cities. Tardiness of crossing enlarges how people perceive the space among buildings of different historical periods with various styles and scales, and therefore weakens the sense of huge fragmentation between the old and new neighborhoods, and brings people physical and mental relaxation.

Taking the city of Milan as an example. As a city with excellent architectural monuments and the fastest urban construction in Italy in the same time, Milan owns architectures of various historical periods, from ancient Roman walls to medieval Gothic and Renaissance buildings, international style during industrial revolution, and digital architecture at present, is all-encompassing. This diversity is both an opportunity and a challenge for the city. According to a social survey, most urban residents prefer to work in skyscrapers while live in low-rise buildings. These streamlined high-rises in Milan fulfill people's psychological needs for modernization and high-tech as they bring a strong visual impact and novelty. But at the same time, the huge differences in style and scale between the old and new built create a sense of fragmentation, especially for these Milanese who live there every day. The rigid and insufficient-transitional boundaries leave the city seems a battlefield divided by various camps. The void between buildings ought to provide people adequate room to breath and adapt themselves to the environment. There are several such cases in Milan.

The City Life area that currently under construction is one of the newest blocks in Milan. It covers 225 thousand square meters area and will become one of the largest pedestrian areas in Europe. As showed in the rendering on the left, the area is centered on three high-rise buildings designed by the Arata Isozaki, Daniel Libe skind and Zaha Hadid respectively, so that the subway station is named "Three Towers". Among the three towers, the one of Libeskind and the one of Hahaidid have been constructed and open to the public while Arata Isozaki's tower is still under construction. Being designed by outstanding post-modernism architects, three towers appear nothing in common with the surrounding buildings that constructed during 18th and 19th centuries, neither the architecture monomer, nor the architecture composition. For the monomer, the height of one single tower is more than ten times higher than any building in the neighborhood, and the facades of the towers tend to be flowing wavy forms instead of monotonous vertical and horizontal ones of the peripheral buildings; For the composition, three towers are clustered in the center of the block, surrounded by green vegetation that extends to the edge of the site. The surrounding plots are in accordance with the traditional Italian street layout, on the contrary, buildings are distributed along the border and enclose a courtyard in the middle. In short, the new block is growing from inside to outside while the traditional ones are growing from the outside to the inside.

FIGURE 5.
Rendering of City Life Area

The public spaces are essentially different in City Life area and its surrounding blocks. Most of the public spaces in the traditional Milan block layout appear as atriums that shared only by residents of this block and not with outsiders. Therefore they can only be regarded as semi-open public spaces whose overall characteristics can be analyzed via the basic principle of figure-ground in urban morphology, and conclusion will be illustrated through a simple, clear and two-dimensional way. However, the public space in City Life area is more complex relatively. It can be divided mainly into two parts, the square among three towers that will be discussed in the following part of architectural scale, and the green area between towers and surrounding streets. The green area is a public park named "a park between mountains and valley". It is located on the periphery of the main buildings and has direct contact with the surrounding environment. As the name implies, the vast green vegetation is planned with slopes, which fluctuates and simulates the spatial effects of mountains and valleys, filling the gap of form between the towers and the buildings around. Along the sloping terrain, there are naturally streamlined trails and bicycle lanes to guide people from outside in an open manner. This artificial micro-terrain not only enriches the spatial form, but more importantly amplifies the surface area of the plot, allowing people to wander longer in this place, and thereby the sense of split cause by buildings of different historical period is weakened.

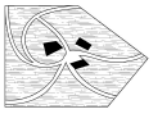

FIGURE 6.
Diagram of Architectural Composition

Not far from City Life area, the Park of Industrial Alfa Romeo is also somewhere that

worth a walk, in fact it is the green area of a residential area with the same name in Milan. The modeling of the park seems is very particular in such a city like Milan, which still manufactures the atmosphere of "between mountains and valleys", but being expressed in a more absurd and philosophical depiction. The micro-terrain here is manifested by the combination of a hill and a lake, which contains the philosophical implication of positive and negative volume. The park is a continuous of another hill named Montagnetta di San Siro. Both of them are built with rubble and excavated earth, linked by a footbridge, just like two reliefs embedded in the city of Milan, balance and coordinate other convex and concave in the city.

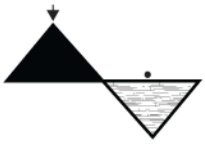

FIGURE 7.
Diagram of Hill and Lake

2) Architecture Scale, Connectedness

We assume that different buildings are states where the same object moves to different moments. For instance, the Roman wall is the state where the object moves to 3 seconds, the parametric building is the state where it moves to 15 seconds, and the buildings in between these two periods can be analogized according to the same hypothesis. Then we can try to capture the deformation laws of the movement of the object, and calculate the characteristics of the blank public space between various states through the conservation of energy. The relationship between traditional architecture and public space is usually clearly divided, since there is always a 90-degree right angle between their surfaces. However, due to the low elevation of the building itself, people in public space do not feel much a sense of distance to the building. After all, the urban space scales at the time when science and technology were not sufficiently developed are humanistic. Yet nowadays, with the promotion of technology, the elevation of the object movement is gradually increasing, as the dream of mankind has always been getting rid of gravity through science and technology. Corresponding to this, the blank space in between ought to be pulled up as the object is stretched upwards, becoming a continuous surface hovering along the surface of the object. In the absence of gravity effects, it is the prototype of Möbius strip in topology.

The square that mentioned above in City Life area is encircled with three skyscrapers. With curved stairs leading from the first floor to the second floor, the whole square is a continuous, band-like surface that spirals along the building skin. As the square ground going higher, people no longer look up to the skyscrapers around from horizon like a frog at the bottom of a well. They have the opportunity to personally reach the surface of the high-rises and go inside of them. Distant becomes at your fingertips. It is the same principle of opening up the ground floor of high-rise buildings for commerce, eliminating people's psychological distance. The surface of public space and building facades are now connected and form a whole, which breaks through the clear divisions of the traditional planning.

MiCo Milano Congresses in the northwest corner of City Life area borders few industrial period buildings and some residential buildings from the 50s to the 80s. Giving full consideration to deal with the relationship with the environs, a liquid flow-shaped roof is designed, which spans two adjacent blocks and covers all buildings in the blocks. On the one hand, the piece of top echoes the parametric style of City Life area and contributes to a nice visual transition between buildings and blocks of different construction periods. On the anther hand, it ensures the unobstructed connectivity between adjacent blocks. Pedestrians under one single roof can walk through freely, regardless of seasonal weather changes. The void between buildings is

no longer just a passing tunnel, but a place where public lives take place.

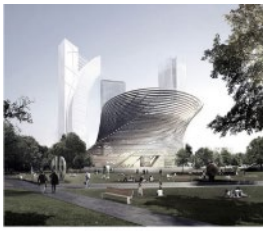

FIGURE 8.
Rendering of Museum of Contemporary Art
FIGURE 9.
Conceptual Diagram

Another upcoming architecture in City Life area, the Museum of Contemporary Art by Daniel Libeskind, has also strong topological features. The building itself is a dynamic process. It has a five-story vertical structure， as it moves upwards, each layer continuously rotates to create a fluid geometry that transforms into a circular terrace at the top. " A highly suggestive geometrical evolution on a vertical axis that recalls not only Leonardo da Vinci's golden section but also spherical astronomy and the process of evolution of art itself, which derives its beauty from the dynamics of transformation, the overlapping of images and the movement of different geometrical figures." [5] Applied advanced materials and building technology, the building pursues the highest level of environmental compatibility and zero-impact the rest of urban life. Moreover, the topological dynamics respond as flexibly as possible to today's unpredictable needs in the contemporary art space.

There is a relatively complete preservation of architecture and public space in Milan during all periods of time. Therefore, many other plots in the city deserve to be studied and compared. The next step of the research is in-depth study of the following selected public squares with a topological approach in order to obtain a longitudinal comparison.

Research Objects:

PUBLIC SQUARE NAME	YEAR	AREA	PEROID
Colonne di San Lorenzo	4 A.D (1935)	1.750 m2	Ancient Roman, medieval
Piazza del Duomo di Milano	14 A.D.	17.000 m2	Gothic, neoclassical
Arco della Pace	1838	16.000 m2	Neoclassical
Piazza XXIV Maggio	1802 (2014)	19.000 m2	Neoclassical
Gallaratese II Housing	1972	5.500 m2	Modern
Piazza Duca d'Aosta	1994	26.000 m2	Contemporary
Hangar Bicocca Milano	2004	1.500 m2	Modern renovation
Piazza Gae Aulenti	2012	7.850 m2	Contemporary

3) Urban Scale, Dynamic Balance

The ideal topological urban model is to allow the various elements and energy in the city to be crossed and parallel but remain order in the same time. The popular urban planning nowadays are the regular grids of Manhattan or Barcelona, which is in contrast to the seemingly undisciplined urban fabric of Mumbai. On the streets, cars, people and cattle walk through each other without causing any traffic accidents. With the second biggest population in India, Mumbai has continued to develop apace in recent years. The city has superior natural conditions, owning a deep natural water harbor, several world cultural heritages and the national park. However, this city is carrying a huge flow of people and goods, which is a challenge to city planning and design. How to maintain the order of the city and ensure people's quality of life in such a dense environment is a question. Although Mumbai still needs to improve the efficiency of land use and housing, but the vitality of the city cannot be ignored. This kind of vitality is the source of life that is extremely lacking in many cities under strict planning.

Topology as a tool and method can capture and analyze the hidden energy and flow

trajectory in cities, then establish a 4-dimentional abstract space model where activities, flows, logistics and other energies in each periods of time are all recorded. When the 4-dimensional virtual model meets the physical environment, the output will be more thoughtful and intelligent, because it understands more the specific needs of various energy and balances them better than a rigid "lattice" city.

4. Reflections triggered by new spatial forms

There are evident indications that the inclination of topology penetrating into urban spaces design. Topology as a neo design tool plays a consequential role in urban design, and topological space as an innovatory spatial form has a great potential for exploration. Thanks to the rapid development of science and technology, the scientific investigation of outer space is accelerating, and the veil of the enigmatic space beyond the earth is being uncovered layer by layer, such as dark matter and quantum etc., which are gradually discovered and perceived by scientists. The traditional notion of spatial dimension will become the past while the multi-dimensional spatial image will be confirmed by science and widely applied. The transformation and expression of topology today cannot yet be arbitrarily implemented since the construction on the earth is restricted by gravity. But one day, if the science and technology are sufficiently advanced, humans could build cities, buildings and parks in an environment without gravity effects, maybe on the earth or another planet. By that time, people will be able to walk along the unorientable surface and through the multi-dimensional space, like in a wonderland. Although the research on topology is only at the initial stage, it has become a trend to use topology methods to analyze and solve spatial design issues. The moment of topology in urban spaces design is coming.

FIGURE 10.
An illustration about gravity

As Prof. Christophe Girot, Chair of Landscape of Architecture of ETH said,

> *[Topology] is to integrate heterogeneous fields of action that can be both physical and philosophical and scientific and poetic – integrating past, present, and future potentials into a single meaningful whole. It will bring different design disciplines together to work on a better understanding of [public space] as a surface and a space in all its inherent beauty and wonder.* [6]

5. Acknowledgement

First, I appreciate the advising and patience my Ph.D. supervisor, Prof. Laura Montedoro has been giving me. Second, I would like to thank Prof. Alessandro Rocca, who first introduced the CA2RE research conference and tutored me along the process. The last but no least, thank Prof. Luca Basso Peressut, my Ph.D. coordinator, head of Dastu department of Politecnico di Milano for his concern and guidance from the first beginning of my Ph.D. journey.

6. Funding

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7. Annotation

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9. Images/Illustrations

FIGURE 1. Möbius Strip. Auther
FIGURE 2. Seven Bridges of Königsberg Problem. Baike.baidu.com
FIGURE 3. Möbius Strip Air Walkway. Blog.renren.com
FIGURE 4. Klein Bottle House. Blog.renren.com
FIGURE 5. Rendering of City Life Area. City-life.it
FIGURE 6. Diagram of Architectural Composition. Auther
FIGURE 7. Diagram of Hill and Lake. Auther
FIGURE 8. Rendering of Museum of Contemporary Art. Hayes Davidson
FIGURE 9. Conceptual Diagram Image. Studio daniel libeskind
FIGURE 10. An illustration about gravity. Julien Pacaud

UAIG (URBAN AREAS OF ILLEGAL GENESIS)
(RE) LIVING TO (RE) INTEGRATE

ANA CATARINA GRAÇA AND
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UAIG (Urban Areas of Illegal Genesis)

(re) living to (re) integrate

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Abstract

This ongoing research intends to develop a strategy for the (re) qualification of the public space in the UAIG (Urban Areas of Illegal Genesis), through the introduction of an intervention methodology – collaborative participatory processes.

The strategies of intervention in the public space have launched new challenges to research in architecture. In a demanding society with strong participatory and collaborative citizenship, public space increasingly assumes an important role in urban practices.

The lack of public space in areas of illegal genesis in Metropolitan Area of Lisbon (MLA), shaped the PhD research question: How public space make UAIG´s (re) living to (re) integrate it in Lisbon Metropolitan Area dynamics?

Participation means the collaboration of people pursuing objectives that they themselves have defined. A public space is one which, in its design and in its use, stimulates a sense of belonging to a wider community beyond the bounds of the strictly private sphere. It is, then, a scenario that fosters contract between difference people mixing uses and meeting place for individual and collective interests.

The answer is to adopt methods and instruments that allow the creation of a methodology for the analysis of a great transversality of scales – territory, neighbourhoods and public space.

This research aims to contribute to a generic model of good practices applicable to any process of requalification of the urban space of the UAIG.

Keywords: UAIG, participatory processes, public space, methodology

Introduction

Over time formal and informal city definitions have been altered or acquired different meanings in the various fields of human activity (Lutzoni, 2016) (Hernández, 2010). Since the 1950s the world has witnessed a phenomenon of rural exodus, large population flows moving to cities in search of better living conditions. However, cities have not capacity to respond to population demand, leading to informal growth of parts of metropolitan territory (Llyod, 1979).

In Portugal, in the 60´s housing alternative was developed, on the margins of the formal market, in rural areas on the outskirts of Lisbon. The phenomenon is denominated clandestine neighbourhoods (Salgueiro, 1972) (Lobo, 1989) until 1995, where it is later designated by UAIG, due to law 91/95 of September, with the introduction of the exceptional regime for the urban reconversion of urban areas of illegal genesis.

The UAIG that derive from unlicensed buildings, in disrespect or perversion of the legislation regarding territorial planning. As a result of illegal subdivision processes on land owned or promoted by local authorities. The neighbourhoods are the result of self-construction and perennial materials and self-

urbanization of the population, and occurred overnight, being immediately inhabited in order to hinder possible demolitions.
The location of the UAIG evidences relations with the space morphology and its proximity to the metropolis, there are already some studies that reveal the location of UAIG in the MLA (DGOTDU, 1996) (Rolo, 2005) (Raposo, 2009) (Gonçalves, Alves e Nunes da Silva, 2010).

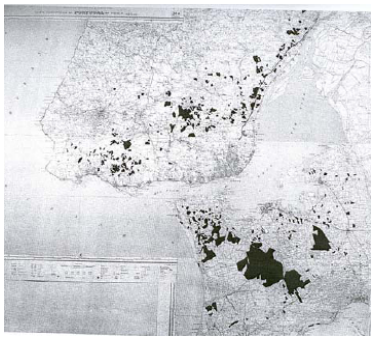

Figure 2: "Conjuntos Habitacionais Clandestinos na Região de Lisboa" (Eugen Bruno, 1984)

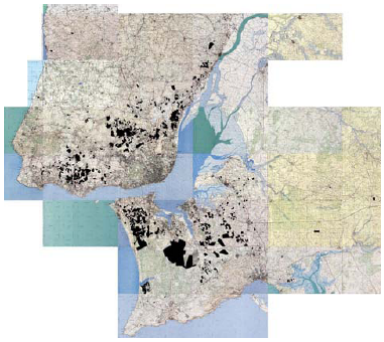

Figure 3: Mapping UAIG (Helena Rolo, 2005)

Figure 4: Mapping UAIG (Isabel Raposo, 2009)

Participation and the idea of collective are increasingly valuable in contemporary discourse and architectural practices (Arnstein, 1969) (Giancarlo de Carlo, 1970) (Habraken, 1972) (Hamdi, 1995, 1997, 2004, 2010) (Sanoff, 1990) (Spinizzi, 2005). Several experiences in the practice of urban requalification at the international level allow legitimizing the paradigm shift (BIG, Topotek1, Superflex, 2012) (Zuloark, 2010) (Ermacora, Bullivant, 2015). The publications on this intervention perspective have been multiplied, expressing the growing disciplinary interest in the field of architecture, especially in the requalification and transformation of informal settlements. There are several architects who value community participation in the strategy of intervening in public space, taking it as a point of spatial, social and cultural relations and identity and cohesion (Rosa, 2011, 2013, 2015) (Andreini, Casamonti, Giberti, 2012) (Jáuregui, 2010, 2012, 2013).
Thus, public space is much more than a formal and spatial definition, it is determined by behaviours that aggregate collective urban experiences (Arendt, 1958) (Merlin, Choav, 2010) and considered a factor of identity, memory and community cohesion (Jacobs, 1961) (Lefebvre, 1974). In order to better understand the importance of the public space in the UAIG and the impact on the life of the inhabitants, it is fundamental to reflect on authors such as Whyte (1980), Gehl (2000, 2010) and studies of Project for Public Spaces (1975 -).

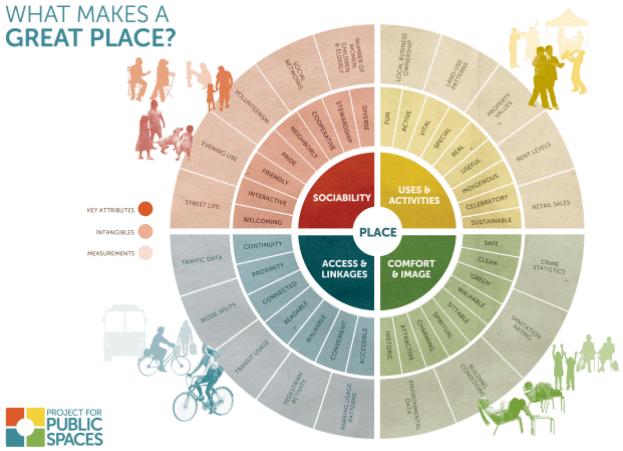

Figure 1: What makes a great place? (Project for Public Spaces, 1975 -)

The general objective of this research is to develop a strategy for the (re) qualification of the public space in the UAIG, through participatory processes, having as object of study the Metropolitan Area of Lisbon, investigates the integrated transformation of the urban design of neighbourhoods clandestine, based on the assumption that the public space is decisive in the spatial, social and cultural relations of identity and values of belonging.

It is aimed to achieve the following three specific research objectives:

- Study the object of intervention by mapping the territory of the UAIG in the MAL currently, geo-referenced in time and space;
- Identify conditions – social, cultural, economic, spatial and formal, and expectations – desires, needs and aspirations of the residents, for the creation or restructuring of the public space of clandestine neighbourhoods, denominated UAIG;
- Analyse and classify good practices of intervention – internationally and nationally, to define, test and validate intervention strategies in the public space of informal territories inserted in urban contexts, in order to promote sociability and sustainability.

The aim is thus to (re) living the public space, in order to strengthen the identity and social cohesion in the UAIG. As well as (re) integrating these territories into the metropolitan dynamics, insofar as they manage to create memories and relations of sociability between the community and others.

Methodology

The present research project requires the critical analysis of a wide transversely of scales – the territory, the neighbourhoods and the public space, having as study area the MAL. To achieve all the proposed objectives it is necessary to carry out a pilot experiment to requalification the public space of UAIG and adopt a methodology divided into seven stages:

- Literature review;
- Urban planning practices to the local scale;
- Mapping and interactive visualization;
- Analysis of public space;
- (Re) qualification the public space;
- Validate the research process;
- Norms and procedures;

Literature review

In the literature review, we intend to prepare a critical review of the literature on the four greater research topics: UAIG, informal settlements, participatory processes and public space. It is intended to investigate the origins of the themes, the different evolutionary variants, the experiences of the spaces and how the participation of the community can change the dynamics of the places.

The study of UAIG will focus on the knowledge of the subject of intervention, in particular on the historical, geographic, social and morphological framework, analysing, among other things, research work already carried out by different disciplinary areas, such as: Isabel Raposo (2010, 2011, 2012), Pedro Chula (2014), among others.

The study of informal settlements will allow contextualizing the portuguese case in the international panorama, reflecting on intervention strategies adopted and planned for these territories, analysing, among others, the fieldwork already carried out by Marcos L. Rosa (2011), Marco Casamonti (2012) and Massimiliano Giberti (2012).

The participatory processes will focus on the methodology of intervention in the public space of these informal settlements, analysing several methodologies already performed in these spaces, including the works of Jorge Mário Jáuregui (2012), John Turner (1976), among others.

The public space will allow to observe behaviours and reactions of the community in the experiences of the space, providing indicators of the quality of life and how the architect can contribute to its promotion, analysing among others, the fieldwork already done by Jan Gehl (2013).

Urban planning practices to the local level

At this stage of the research it presupposes an intensive framing and analysis of local urban planning practices. Data collection of intervention practices in the public space in informal settlements, at national and international level (Europe and Latin America), including community participation. An interactive taxonomy of participatory practices, taking into account the multiple dimensions of the views of the project authors. Measurement of good practices and structuring of intervention strategies to be applied to the pilot experience in UAIG.

Mapping and interactive visualization

It is intended to map the currently delimited UAIG, in the 18 municipalities that make up the MAL, area of study, creating an interactive chronology (years 60, 70, 80), referenced in GIS, in time and space (location), with images, videos and photos and with some statistics socio-demographic information (census 2011) and morph typing using classification criteria: 1| UAIG with allotment permit issued; 2| UAIG with reconversion of municipal initiative; 3| UAIG with reconversion of private initiative; 4| UAIG without process initiated of reconversion; 5| UAIG without urban redevelopment. When mapping, it is possible to verify the evolution of UAIG in the territory (origins, consolidation and interrelationships with the environment) and interactive form. The visualization of these data will allow to select a municipality, using several criteria of analysis (date approval of the UAIG delimitation; state of allotment; total area lots, among others). For the municipality will be carried out a data analysis in network, through an interactive diagram (type Kumu.io). After to choose the municipality, the cases of intervention of this municipality are selected, through selection criteria – morphological, social, environmental and economic, using the same tool of the selection of the municipality – interactive diagram (type Kumu.io).

Analysis of public space

In this stage we intend to analyse the cases of intervention selected in the previous stage, through a quantitative and qualitative analysis. The quantitative analysis will involve a set of technical theories of analysis of the special configuration of the built environment (type space syntax) (Hillier and Hanson, 1984) and morphological evolution (Lynch, 1960). Criteria for analysis will be used, such as: accessibility, mobility, habitability and scale of intervention. Qualitative analysis, direct observation, will go through inquiry techniques (questionnaire and interviews); mapping of courses with a sample of residents; to identify desires needs, aspirations of local residents and community participation (Nambi, 2010) (Gehl, 2013). When analysing the UAIG of a municipality, it is intended to select the public spaces more favourable to the pilot experience.

(Re) qualification the public space

The fifth stage involves (re) qualification the public space, selected and analysed previously, through community participation conducting interviews, workshops, models, having several criteria for (re) qualification of space – comfort, integration, scale and observation. Realization of full-scale prototypes through digital manufacturing processes. At this stage, we intend to do the pilot experiment, to verify the whole process so far proposed.

Validate the research process

This stage is to test/validate the all process, implementing the solution at least in a case of intervention. The process ends with a new quantitative and qualitative analysis. Realize interviews and videos to understand the satisfaction of the population in the participation of (re) qualification of the public space.

Norms and procedures

The last stage of the methodology involves the definition of norms and generic procedures for the introduction of bottom-up processes that promote a sustainable citizenship and co-governance in the UAIG in MAL.

Expected results

Although the increasing critical reflection on how the quality of public space can improve the well-being of people in urban space at different levels, in Portugal, the dimension of the requalification of public space in UAIG has been sent for second plain.

The results of this investigation are a generic model of good practices applicable to any process of urban space requalification of UAIG.

In this research project we intend three specific contributions: 1| scientific contribution, to put the theory into practice, rethinking the discourse on the strategies of making architecture in the contemporary context and the urban practices of intervention in clandestine neighbourhoods; 2| contribution to MAL, through a new vision of UAIG; 3| contribution to the UAIG and to the municipalities, altering the urban requalification processes, with the introduction of bottom-up processes that promote a sustainable citizenship.

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A PARTICIPATORY EXPLORATION OF THE POTENTIAL OF URBAN WAITING SPACES TO INCREASE URBAN RESILIENCE

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A Participatory exploration of the Potential of Urban Waiting Spaces to Increase Urban Resilience

Abstract

This paper discusses research produced in the framework of the 'SWOT-Mobile' project, an ongoing Living Lab aiming at developing and testing a model for the co-creation of solidary living in mobile homes on Waiting Spaces in the Brussels-Capital Region (BCR). We specifically focus on the aspect of temporary use of Waiting Spaces within this project. Using our preliminary findings, we reflect on the potential of such un(der)used spaces awaiting redevelopment to increase urban resilience.

The paper starts with a background section, exploring of the phenomenon of temporary use (TU). In this sections, we situate TU in a historical perspective and distinguish between different reasons for TU. Next, in the methodology section, we elaborate on the Living Lab and action research methods used in the 'SWOT-Mobile' project. In the results and discussion section we present the SWOT-Mobile project, as case of 'TU as research', fitting in the current stage of the development of spatial planners and designers' interest in the temporary use of Waiting Spaces, in which Waiting Spaces are becoming become platforms for engagement and are taking up a transformative/transitionary role in the making of the city. Furthermore we are discussing the approaches and results of the action research cycles realised during the first of three years of development of the project. Finally analysing the preliminary findings of the SWOT-Mobile project, we conclude that Waiting Spaces are indeed becoming become platforms for engagement and that they can take up a transformative/transitionary role in the making of the city. But, the contribution of the SWOT-Mobile project is still very much under development. It remains to be seen if the encountered constraints will be overcome and if the model, being developed, will indeed provide an innovative answer to the lacking social housing provision in the BCR and the reduction of the abundant amount of un(der)used spaces in the long run.

Keywords

temporary use, Waiting Spaces, urban resilience, solidary mobile housing, Brussels-Capital Region

1. Introduction

In the BCR an abundant amount of un(der)used spaces are waiting to be developed [1, 2]. The majority of these sites such as West Station, Tour & Taxis and the Canal-zone are located in a privileged position, near large urban areas, and have a surface area between 5000 to 20.000 m². But also many smaller areas are vacant and function as waiting areas for future urban development. The territorial development agency has identified more than a dozen of sites as areas that would be very useful for temporary use until future projects are realised [1]. As vacant lots and leftover spaces often create a negative atmosphere and are associated with speculation and possible dangers, many cities are already employing the temporary use of Waiting Spaces for sustainable valorisation of the city.

Another serious social and economic problem the BCR is facing is related to poverty and housing. Because the housing market does not offer an answer to the needs of many inhabitants, the right to housing is not guaranteed in the BCR. The increasing number of households on the waiting list for social housing (43,096) illustrates a lack of social housing where less than half (44.9%) of the demand is met. Many inhabitants are thus dependent on the private market, where the rents are not adapted to tenants' possibilities [3]. Due to lack of alternatives, many people feel that they have little influence on their situation and they have to live in an unhealthy, too small or too expensive home. Also, in 2015, the number of homeless people in the BCR increased by 33% compared to the previous census in 2010 [4]. In the context of this affordable housing crisis [5] there is a clear need to develop alternative forms of housing that are better oriented to the vulnerable groups; especially the houseless.

This study is part of the 'SWOT-Mobile' project, an ongoing Living Lab aiming at developing and testing a model for the co-creation of solidary living in mobile homes on Waiting Spaces in the Brussels-Capital Region (BCR), with the aim to create an innovative solutions to the challenges described above. In this paper, we are specifically focussing on the aspect of temporary use of Waiting Spaces within this project. Using the projects' preliminary findings, we are reflecting on the potential of these places to increase urban resilience.

2. Background

2.1. Waiting Spaces as the object of research

There exists a wide variety in Waiting Spaces. They can be public or private sites, large or small scale and they can be built or unbuilt. However, a common feature is that they are spaces that have been abandoned by the previous use(r), and for which a future function still has to be determined or for which the realisation of the future function is delayed for various possible reasons (including e.g. planning processes, financial complications or unexpected technical issues). As such these spaces seem to be 'temporarily out of use'. They exist in some sort of interval, a 'waiting period' in their functionality, hence their name.

As, from the perspective of the current economic space cycle, Waiting Spaces are apparently 'useless', they tend to temporarily fall out of the attention of the mainstream urban actors, leaving them readily available for temporary use by others.

2.2. Temporary use in a historical perspective

Based on the exploration of a body of literature from the fields of urbanism, urban planning and urban management and in lesser extend planning theory [6] three stages can be distinguished in the development of spatial planners and designers' interest in the temporary use of Waiting Spaces.

In a 'preliminary stage' (1960-1990's), there was virtually no attention for what spontaneously occurred in un(der)used spaces awaiting redevelopment. Nevertheless this is an important phase as here the settings for later attention are emerging. This stage is characterised by a context of transformation from the industrial to the post-industrial city, of 'suburbanisation' and of the growing awareness of an ecological crisis. In this context the attention is turned towards the spaces that are results or leftovers form these transformations: (inner city) vacant lots and/or un(der)used spaces. In line with the rational approach in this post-industrial context, the focus was mainly on how to re-develop and re-integrate these spaces in the mainstream city in a traditional, planned and end-result oriented, way. In 1976, for example, the UK Department of the Environments issued a publication on how to 'reclaim derelict land and restore it to a beneficial use as soon as possible'.

This started to change in the light of the economic recessions. In the 'early stage' (1990's-2006) - while turning the attention towards finding cheaper or easier-to-realise solutions, both in terms of locations (available at low cost) and programs (spontaneous, self-organizing) - some authors are noticing how, even without official redevelopment efforts and despite failing or stalling official processes, interesting things are sometimes going on in un(der)used spaces. In this context the phenomenon of temporary use becomes the subject of several publications, in which its characteristics are examined, often through case studies. In their 2000 publication 'Spaces of Uncertainty', Miessen and Cupers for example describe 'the margins' of the city as 'possible public spaces'. According to them, these are essential to conserve the crucial characteristics of public space (openness and unpredictability) in confrontation to the 'functional units, the highly structured, programmed, and controlled spaces in the contemporary city'.

Finally, in the third 'maturing' stage (from 2007 onwards), the mechanisms and systems behind temporary projects are studied in-depth and the emphasis in the literature on temporary use evolves from an exploration of the characteristics and potentials of the phenomenon towards an attempt at consolidation, embedding and institutionalization. In this stage we see the publication of works that are specifically dealing with temporary use in the framework of urbanism. In their 2003 book 'Urban Catalyst, The power of Temporary Use', Oswalt, Overmeyer and Misselwitz are for example providing recommendations for architects and city planners on how to incorporate this phenomenon into urban planning.

At the same time, in this stage we are also seeing works that are broadening the scope, beyond the sole focus on temporary use, by considering the whole sphere of activist urban interventions by civil society actors operating outside of the standard planning processes. As these are moving towards a more general and comprehensive description of a renewed approach to urbanism, we can claim that, at this point, we are beginning to determine a paradigm shift [7]. All around the world, citizens are starting to claim a shaping power over the ways in which our cities are made and remade [8]. Because of this spatial planners, designers and managers are more and more motivated to find new ways of engaging with a multiplicity of actors and stakeholders wanting to be involved. Against the backdrop of the worldwide 'commons movement', un(der)used spaces seem to become ideal platforms for alternative actors to take the centre stage and for new (power) relations and new ways of engagement to develop [8, 9, 10, 11].

2.3. Reasons for temporary uses

Here we want to clarify that our focus is not on activities in which temporality is a pre-requisite (like e.g. markets and fairs). Rather we are focusing on activities that are temporary for other reasons. We distinguish roughly four other motivations for temporary use (TU): TU out of necessity, TU because of an opportunity, TU as activism and TU as (action) research. However, these different forms frequently occur in combination with each other.

In the case of '**TU out of necessity**' we are dealing with users who are unable to carry out their activities in the usual urban spaces. They are resorting to the cities leftover spaces, basically because they have no other choice. Think for example of a young artist who is renting an inexpensive workspace in a vacant building because he or she has insufficient means to rent a nice, fully equipped studio. Cost saving is indeed often a priority in this type of TU. An example from the BCR are the temporary settlements in the Maximiliaanpark. In 2015, due to a lack of shelters, hundreds of refugees had to camp in the park while awaiting the processing of their asylum application by the Immigration Office, located nearby. And today again the park is being used as a temporary camp, this time by 'transmigrants', trying to get to the United Kingdom from Brussels.

'**TU out of opportunity'** involves users who are seeing an opportunity in un(der)used spaces and are trying to realise a surplus for themselves through their temporary use. Think for example of children building a camp on a vacant lot. In this type of TU the agenda of the user is the priority and the site is more or less seen as a blank canvas. An example, from the BCR is the 'Property Guardians' service, offered by Camelot Europe, a commercial organisation that offers vacant real estate guardianship through temporary occupation. The temporary residents benefit of the relatively low rent and the sometimes exceptional locations they can reside in. The property owners benefit of the fact that their property is not left unattended. But, as they are charging both to residents and the property owners, probably the one profiting the most is the organisation itself. As part of this type of TU, we can also consider all sorts of city marketing projects, aiming to put an specific place or area on the city's 'mental map' by organising hip activities in anticipation of planned urban redevelopments. A Brussels example of this is the 'Cityscape' project by Arne Quinze. This project involved a work of art, consisting of wooden sticks forming some sort of canopy, creating a temporary public square on a vacant lot on the Avenue de la Toison d'Or. As it was much visited and photographed the project added attractiveness to the commercial neighbourhood. Moreover, as it was financed by BMW Mini (BeLux), this company was allowed to regularly use part of the site for the organisation of trendy promotional events.

In the case of '**TU as activism**' we are dealing with users who are reacting directly to a (spatial or ideological) challenge of a space and/or its surroundings. Projects in this case are often starting from the ideological motivation to realise a 'better' city. They are rejecting the bureaucratic manner in which cities are being managed nowadays and through their actions are trying to overcome spatial and/or social inequalities. We can see the temporary occupation of the former office building at the Koningsstraat 123, in Brussels, by the NPO Woningen 123 Logement, as an example of this. Starting from the idea of 'social integration through housing' this NPO strives to help people having difficulties to find a place to live (for financial and other reasons). Therefore they are occupying vacant buildings in Brussels and making them available as very accessible, alternative social housing.

Finally, the users practicing '**TU as research**' are considering Waiting Spaces both as an issue and a possible solution. Their primary goal is knowledge production; often these users are considering traditional (top-down) approaches to be ineffective and they are aiming at developing innovative solutions. At the same time these users want to test out possible alternative approaches in real life and engage the bottom-up energy of the city in their search. An example of this is the SWOT-Mobile project discussed in this paper.

3. Methodology

3.1 The SWOT-Mobile Living Lab

In literature, it is possible to find various approaches to Living Labs [12, 13]. Different researchers describe it from different perspectives as a network, a platform, a context, a method, an interface or a system. Inspired by Higgins and Klein in this study, we frame the key characteristics of Living Labs as:

1. A laboratory focusing on the empowerment and inclusion of the users in the research and creation processes
2. A real-world setting aiming at real-world impact, involving multiple stakeholders from multiple organizations and enabling their interaction
3. The researchers observe and take part in the creation of an outcome

4. Multi-disciplinary research teams are actively involved in the research settings, confronted with the technical, social and political dynamics of innovation

The stakeholders included in the SWOT-Mobile Living lab are:

- eight future inhabitants (houseless people who have lost their grip on their housing track),
- other houseless people facing the same problems that will be involved in different phases of the project,
- the surrounding inhabitants and neighbourhood organisations,
- the local and sub-local authorities (the local Council, social services, the Housing and Urban Planning departments of the BCR, social housing associations, ...),
- employees of the NPO Samenlevingsopbouw Brussel (SLO), an association focussing on community building,
- employees from the NPO Centrum voor Algemeen Welzijnswerk (CAW), an association providing personal support on general wellbeing,
- lecturers and students from the Faculty of Architecture at KU Leuven, campus Sint-Lucas Brussel,
- and employees from the NPO Atelier Groot Eiland, an association focussing on training and social employment.

Together these partners are co-creating eight affordable mobile housing units and a collective space enabling interactions with the neighbourhood. The Lab is resulting in the co-creation of a learning space with all the partners - including the houseless, a group that is usually not involved in this and that generally doesn't have much to say on their housing track. By taking part in every step of the conceptualisation and the construction of their own houses, the future inhabitants will not only build individual housing units, but gradually also create a solidary living community, in interactions with the surrounding neighbourhood. Through this, besides regaining a grip on their own housing track, they will regain a grip on their whole life. As such, in this project, experimental forms of empowerment and inclusion are being explored with a focus on solidarity and interaction. In its intentions the SWOT-Mobile project is thus an illustration of how, in the contemporary context, Waiting Spaces can act as platforms for engagement and how they can take up a transformative/transitionary role in the making of the city. In what follows we are analysing to what extent this is already becoming apparent on the field, in the project, after the first of three years of development.

3.2. The Action Research

The Living Lab methodology employed in the SWOT-Mobile project involved three big action research [14] cycles (Fig. 1):

- C1. Co-Planning and Site Selection Cycle (Spring 2017) (Completed)
- C2. Co-Design of Temporary Use and Prototyping Cycle (Summer 2017-Fall 2018) (Ongoing)
- C3. Development, Evaluation and Dissemination Cycle (Fall 2018-Spring 2019) (Future)

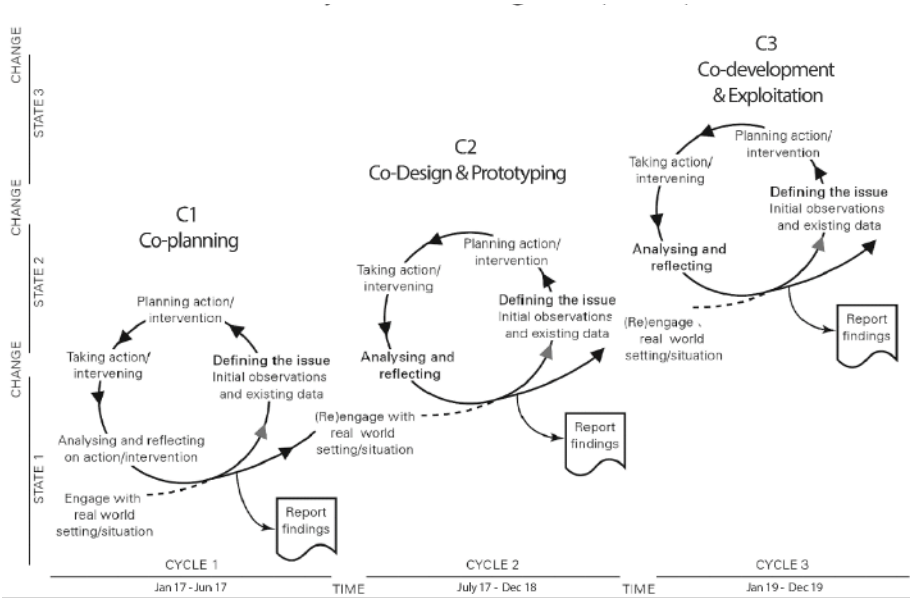

Figure 1. Schematic Representation of the Three Big Action Research Cycles of the SWOT-Mobile Project (Image: Action research cycles [14] adapted by Burak Pak)

Each of these big cycles have particular goals, to be realised through a number of smaller steps. Each of these steps are in fact in their turn smaller action research cycles, consisting of the same defining, planning, executing and analysing stages as the bigger cycles. In this way, the bigger cycles are in fact fractal.

For the completed Co-Planning cycle (C1), which involved the participatory planning of the project with the contribution of CAW and SLO, the smaller cycles included:

a. the project planning (definition of criteria,…)
b. the selection of the future inhabitants
c. the selection of the temporary use site
d. and the first part of the legal research

For the ongoing Co-Design and Prototyping big cycle (C2) the smaller cycles included:

a. the guidance of the future inhabitants
b. the preliminary design
c. the second part of the legal research (ongoing)
d. the detailing of the design (ongoing)
e. the financial research (ongoing)
f. and the building of the prototype (in preparation)

This action research method is providing us with an open framework that enables the use of different tools adapted to the particular goals of each cycle (focus group meetings, semi-structured discussions, surveys, participatory mapping). In the following section we are discussing the detailed approaches and results of the already realised cycles.

4. Results & Discussion

First of all, looking at the SWOT-Mobile case it can be recognized that this project fits the description of 'TU as (action) research'. As described in the introduction, the issues the project is dealing with are the fact that the social housing provision in the BCR is lagging behind (both on the level of quantity and quality) and the abundant amount of un(der)used spaces awaiting redevelopment. In line with our description of TU as action research, the project partners are searching for innovative solutions and are engaging the bottom-up energy of the city in this search. As in this project, experimental forms of empowerment and inclusion are being explored with a focus on solidarity and interaction. The SWOT-Mobile fits in the in the third 'maturing' stage of the development of spatial planners and designers' interest in the temporary use of Waiting Spaces. The aim of the model use TU to give houseless people, now facing social deprivation, the opportunity to participate in the co-creation of their own homes, as well as to contribute to the shaping of their environment.

In this section we are discussing the approaches and results of two of the smaller action research cycles realised during the first of three years of development of the project: C1.c. Selection of the Temporary Use Site and C2. b. Preliminary Design of the Housing Units and Collective Space(s), as these are the most directly related to the focus of this paper.

For the **Selection of the Temporary Use Site (C1.c)**, a GIS database has been set up with more than 150 locations provided by Perspective Brussels (governmental agency for territorial planning). Specific socio-spatial indicators were calculated for each site and maps were created using these. The main indicators were: flood risk, pollution level, income level, density, accessibility, access to green areas, unemployment, ethnic diversity and facilities. Our literature study showed an abundance of approaches for determining the suitability of the sites for affordable housing. Some studies suggested placing affordable housing in high-income areas to increase the socio-spatial urban mix and to guarantee job opportunities and safety. Other studies then suggested areas with a lower income level and well-connected central neighbourhoods could facilitate better integration. Furthermore, various studies reported that green infrastructure and parks have a positive impact on health and to recover. In addition, in the specific context of the Brussels-Capital Region, the preselection of Perspective Brussels showed that the areas of the former industry have enormous potential for temporary use in anticipation of their redevelopment. In this context it is impossible to say that an optimal generalized prescriptive top-down solution is possible, but rather a local, *satisficing* solution to be consulted with the houseless. In order to continue our research in a systematic way, we have organized workshops with representatives of the future inhabitants to set up alternative scenarios based on user preferences literature study, and the site selection research. These resulted in four alternatives:

Scenario 01 Temporary Use in Low Income Central Area: This scenario provides housing in low-income, central urban areas where residents are well connected with all social services and neighbours would have a similar status. In this way the inhabitants may find it easier to integrate. New developments can also help to create new quality spaces in impoverished neighbourhoods with social control by the new residents.

Scenario 02 Temporary Use in a Low Density Area with Access to Green Infrastructure: This scenario provides housing in residential areas with low density and many green spaces. Due to the low density, the risk of resentment with the neighbours is reduced, there is more freedom for the newcomers and it offers the possibility of more personal contact with a stronger community.

Scenario 03 Temporary Use in an Industrial Site under Redevelopment: This scenario provides housing on sites that are in redevelopment and are either industrial sites or are situated next to those. This allows to be a pilot project for future redevelopments in the neighbourhood. Such locations would have much less resentment with the existing neighbours and give more flexibility and freedom. The scenario starts with limiting the selection of all sites that Perspective Brussels indicated to those in the area indicated as Space for Reinforced Development of Housing and Renovation.

Scenario 04 Temporary Use in a High Income Central District: This scenario provides housing in neighbourhoods with a higher income and mixed use. Areas with higher incomes are also much safer and have stricter social control, this might help prevent the homeless people to relapse into self-destructive habits. These areas also have higher quality public spaces and are near better paid jobs.

Visualizations and surveys for these scenarios were prepared and distributed among reception centres for homeless people to get to know preferences and get other feedback. Based on the scenarios specific formulas were created for the selection of the locations, which allow to filter these sites in a qualitative and systematic way. This **top-down** search was combined and followed by **bottom-up** actions which involved a) the addition of sites known locally but not covered by the choices given by the agency and b) contacting the owners of the selected sites and consulting relevant authorities to learn about their attitudes on a possible temporary use. In complex contexts such as the Brussels Capital Region with 19 small-scale municipalities and linguistic tensions, a combination of both approaches proved to deliver the most reliable results.

In the framework of the **Preliminary Design of the Housing Units and Collective Space(s) (C2.b)** an architectural design studio has been completely reconfigured at the KU Leuven, Faculty of Architecture. The 'maib14 Solidary Mobile Housing (SMH) Design Studio' took place weekly from 27.10.2017 until 10.02.2018. The group consisted of 17 students of the first year International Master of Architecture, the eight future inhabitants, the KU Leuven tutors and researchers (Yves Schoonjans, Burak Pak, Ken De Cooman and Aurelie De Smet) and representatives of SLO and CAW.

The topic of the SMH Design Studio was the design of temporary housing units and collective space(s) according to the criteria, which were collectively defined by the project partners in the former cycle. The studio coordinators, Burak Pak and Ken De Cooman, interacted with the students on a weekly basis. Aurelie De Smet took part in this form the standpoint of a participating observer, focusing on the co-organization and documentation the overall process. Every week, one or more representatives of the other project partners (SOB & CAW) were also 'butterflying' in the studio to consult with the students and give them feedback. On a very regular basis external experts were invited in the studio to give presentations on specific aspects related to the project (first half of the semester) and/or to give consultation on specific questions (second half of the semester). The CAW guided future inhabitants were invited to participate in the studio whenever they liked. Every 4-5 weeks representatives of all the project partners gathered with the future inhabitants and external experts to reflect on the proposals.

As a location for the studio we aimed at finding a less institutional, more low-threshold location where students can learn about temporary use by experiences. We wanted to create a workplace, where we could collaborate freely with the students and future inhabitants. From this perspective we joined the temporary use of the 24th floor of the WTC 1 tower organized by the KU Leuven Faculty of Architecture. Mainly three tools were employed during the design studio to accommodate the involvement of the future inhabitants and SLO and CAW representatives: Participatory Site Visits (C2.b1), Participatory Hands-on Workshop (C2.b2.) and Participatory Reviews and Evaluations (C2.b3). We are discussing them here.

Participatory Site Visits (C2.b1): The aims of the site visits were to explore the temporary use sites selected for the design studio with the students and the future inhabitants, and to organize a first encounter between the sites, the future inhabitants and the project team, including the students, helping them to getting to know each other. During the second studio-session, the six sites selected for the design studio in the participatory project planning and site selection cycles (C1.a & C1.b) were visited together with the project team, the future inhabitants and the students. We only visited the 'priority sites' to not to overload the program and picnicked

on one of the terrains to enabled eating together as a convivial activity. We asked from the groups of students prepare a leaflet following a simplified communication strategy covering the first analysis of the sites to provide to the future inhabitants a tangible memory of the trip.

All the participants visited all the sites, they discussed them with each other, the tutors and with the future inhabitants. The future inhabitants expressed their first impressions about the sites both during the visits and in a debriefing with SLO and CAW representatives afterwards. As a result, one of the initial sites was rejected by the future inhabitants. For the purpose of the studio it was replaced by one of the 'backup-sites'. There were several challenges to this task. Afterwards the future inhabitants reflected on the visited sites in a debriefing with SLO and CAW and their reflections were successfully passed along to the students.

Participatory Hands-on Workshop (C2.b2): The workshop was organised during one week. For the students the aims were: to work intensively on the design studio project and become aware of the 'buildability' of their designs and the need for 'conscious use of materials' by focusing in depth on materials & building details (while until then they were mainly working on urban and spatial configuration concepts). For the future inhabitants the aims were: to think and talk about the notions public and private (on the level of the units (internally) and the neighbourhood (externally)) and to communicate ideas and needs to the students. The students were given the assignment to realise a building detail on scale 1/1, 1/2 or 1/5 and the researchers organised a number of lectures, workshops and visits for them addressing the topics of materiality and buildability. The future inhabitants got involved in group conversations with SLO and CAW use of cardboard and tape to test out different spatial configurations for the interior of the housing units on a 1/1 scale. Furthermore a number of joint activities has been organized with students and future inhabitants. Among these are the visit to other temporary use examples such as Home for Less and a visit to Labland, to see the mobile house they are building.

By getting engaged in hands-on 'making' activities, the students and the inhabitants started to consider the 'buildability' of the ideas they have co-created. The future inhabitants had a lot of group conversations leading to more clarity on their wishes concerning the notions private and collective. These were presented to and discussed with the students. The future inhabitants participated in design conversations, searched for creative solutions, drew their own plan setting out 18m2 with tape and cardboard

Participatory Review and Evaluations (C2.b3): In order to empower the participation of future inhabitants and the representatives of SLO and CAW, every 4-5 weeks we organised participatory review and evaluation moments to reflect on the proposals (Fig. 2 & 3). During these review and evaluation moments the students thus received feedback, both from 'experts' and from the future inhabitants themselves.

Figure 2 & 3: Review moments with the future inhabitants and representatives of CAW and SLO in the SWOT-Mobile Design Studio at the KU Leuven Faculty of Architecture (team: Burak Pak, Ken De Cooman, Aurelie De Smet, Geraldine Bruyneel, Tineke Van Heesvelde, Dieter Vanden Broeck, and Yves Schoonjans) (Photographs: Burak Pak (left) & Aurelie De Smet (right))

For these sessions, we experimented with three different configurations. Unfortunately we don't have the space to expand on these here, but from these experimentations we concluded that: (1) a lack in experience in dealing with the many the constraints a realistic temporary use project is entailing can limit the design output, (2) time-limitations, the quality of the provided materials and a lack of experience in reviewing architectural/urban projects sometimes inhibited a thorough understanding of and in-depth knowledge

exchange on the design proposals, (3) organizing separate sessions with the future inhabitants provided the chance to really engage in conversations with the students, (4) providing accompaniment by 'professionals' from each field (to literally and figuratively translate the conversations) facilitated the knowledge exchange with the future inhabitants and (5) preparing good quality, comparable material facilitated the understanding of the different architectural proposals. In order to evaluate the student works we have developed and used a set of criteria, driven from the necessity of temporary use and interactive workshops with the future inhabitants. These included mobility, demountability, reversibility, eco-consciousness, affordability, adaptability, flexibility, informality, incrementalism, openness and economical innovation.

6. Conclusions

Analysing the preliminary findings of the SWOT-Mobile project described in the previous section, the following observations are made.

- From the traditional point of view, Waiting Spaces are defined the residual spatial products of contemporary urban planning and useless leftovers [15]. Furthermore, for the ordinary users they can be intimidating pieces of land, a stage for illegal activities. In contrast to this the SWOT-Mobile project is challenging the problem of legitimacy of temporary use in education and practice. The organized design studio helped us to break the prejudice towards temporary use of Waiting Spaces by illustrating the affordances of the Waiting Spaces through design.
- Organizing a participatory design studio on temporary use in a temporary use site (24th floor of the WTC 1 tower) provided a less institutional, more low-threshold location where students could learn about temporary use by experiences and collaborate freely with each other, the tutors, the involved civil society organisations and the future inhabitants.
- Design thinking about temporary use triggered designing with time in mind and helped students to establish a novel link between space and time which overcame the past conception of programmatic *statis*, by reframing the urban-architectural project as a 'process of change' [16]: in which a) understanding space and everyday activities through time, b) creating space-time scenarios for an urban project and c) and solid strategies and architectural solutions for time-based use are central.
- The Selection of the Temporary Use Site showed that combining top-down and bottom-up is crucial for designing temporary use. A key success criteria for temporary use is the level of involvement of the users, locals and authorities in the making of the project. Neither the random occupation of a site with citizens is sustainable practice, nor the imposition of temporary use by the authorities without consultation.
- Temporary use brings in a plethora of constraints: from a pedagogical viewpoint as well considering design creativity, the constraints of temporary use can overwhelm the designers and limit the diversity of the design output.
- Temporary use invokes a particular type of design criteria. A dynamic understanding of space and use makes us consider mobility, demountability, reversibility, eco-consciousness, affordability, adaptability, flexibility, informality as inherent characteristics of the architecture of temporality.
- The liminality and envisioned performative nature of architecture in Waiting Spaces, extensive appropriation of light and reversible materials combined with a respectful attitude towards the natural elements on the site brings in a new aesthetics.
- Designing, teaching, learning, facilitating and participating in temporary use shifts the traditional roles. This requires transdisciplinarity and social practices with a stress on particular engagement strategies such as networking.

From these observations we can conclude that throughout the SWOT-Mobile project Waiting Spaces are indeed becoming become platforms for engagement and that they can take up a transformative/transitionary role in the making of the city. As such Waiting Spaces prove to be ideal stages for of Latour's hybrid forums [17]. They can be seen as real-life laboratories, where alternative actors can take the centre stage and new (power) relations and new ways of engagement can arise. In this way innovative, alternative approaches can be created and tested out though the temporary use of Waiting Spaces. This are indeed the ideal context for a more resilient urban future develop. But, as the SWOT-Mobile project is still very much under development, it remains to be seen if the encountered constraints will be overcome and if the model, being developed, will indeed provide an innovative answer to the lack of social housing provision in the BCR and the reduction of the abundant amount of un(der)used spaces in the long run.

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Images/Illustrations

Figure 1. Schematic Representation of the Three Big Action Research Cycles of the SWOT-Mobile Project (Image: Action research cycles [14] adapted by Burak Pak)
Figure 2 & 3: Review moments with the future inhabitants and representatives of CAW and SLO in the SWOT-Mobile Design Studio at the KU Leuven Faculty of Architecture (team: Burak Pak, Ken De Cooman, Aurelie De Smet, Geraldine Bruyneel, Tineke Van Heesvelde, Dieter Vanden Broeck, and Yves Schoonjans) (Photographs: Burak Pak (left) & Aurelie De Smet (right))

TOWARDS URBAN SOUND DESIGN FOR TRANSITIONAL PUBLIC RAILWAY PARK/PLACES

SONIC STRATEGIES FOR ENGAGEMENT, CRITICAL AND SPATIAL DESIGN

CAROLINE CLAUS AND BURAK PAK

Towards Urban Sound Design for Transitional Public Railway Park/Places: Sonic Strategies for Engagement, Critical and Spatial Design

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Abstract.
The undeveloped open space along the Western ring railway L28 has long been marginalized in Brussels planning processes. Thanks to its natural, historical and ecological richness the urban edge area is an excellent research object, especially in the context of urban sound design. Within the context of public park/place development along the Brussels railway line L28, urban sound is dominantly discussed as a nuisance to suppress. Urban studies increasingly recognize sound as a medium for community building and political action. Recent research in urban sound studies focuses on how collective listening practices help to develop a critical ear for urban space, thus contributing to productive reflection on future spatial plans. The search for alternative strategies for engagement, critical and spatial design is supported and inspired by the work of artists and musicians making new aesthetic experiences and new ways of (physical) mobilization developments possible. Understanding an urban area in transition as a negotiable atmosphere of sonic and vibrational possibilities, encourages a review of the role and position of sound and vibration in the design of transitory processes for public railway park/places. Via (pro-) active involvement in the design and participatory processes for transitional public railway park/places in Brussels, the Ph.D. project questions pre-established thought patterns on urban noise and urban development. Through hyper-contextual urban sound design, the project explores methods and tools for working with sound and vibration in the design of urban transition. As a step towards a global approach, the findings will be situated in relation to a cultural- historical, a morphological, a design and performative perspective on sound and urban transition.

Keywords: urban sound design, vibrational nexus, urban transition, public space, infrastructure space

1. INTRODUCTION

Urban sound is still poorly addressed in the design of future public space [1]. An important part of this Ph.D. project consists of exploring how urban sound can be tackled as a design challenge in a context of urban transition. Our main objective is to develop a sonic approach to urban sound design, grounded in artistic and community engagement practices, and discussed and tested in urban sound design studios on site. Whereas limited or repressive sonic approaches make many urban designers lean in resignation or neglect, building on tactics and ideas used by sound researchers and artists, we

aim for a constructive approach to urban sound, confronting constraints and deploying most of them as productive forces in the design process. Once sound is understood as a potential constructible aspect of the urban environment, it can be defined as a design challenge in a context of urban development. One that necessitates appropriate urban design concepts.

2. CONTEXT

For our research, we chose to focus on public space development along the Brussels railway line L28 with among others PAD West Station, PAD Tour & Taxis, the Canal Plan and the Regional Green Network as priority projects. This part of the Brussels Zennevallei became fully industrialized in the nineteenth century. The construction of the railway L28 and industrial buildings and housing alongside the rail line contributed profoundly to the fragmentation of the original landscape structure. With the emergence of new modes of mobility and the disappearance of industry, the area experienced a period of deprivation that lasted until the beginning of this century. Where frogs once croaked over the ponds of marshland, now freight trains are rumbling, the dull thuds of truck maneuvers, the immersive drone-waves of airplanes, the piercing sounds of trams and underground trains sliding over iron, and the buzzing drone hovering produced by helicopters flying over the area, can be heard. After decades of neglect with wastelands and empty buildings as a result, West Station received recent attention. With the reorganisation of the Brussels metro network, and the opening of the new station in 2009, West station became an important hub for public transport in the metropolitan Brussels area. Today it is one of the strategic areas for Brussels regional development. A research by design in this area, realized by Coloco, Devspace and Gilles Clement in the context of the study Metropolitan Landscapes [2], argued in favor of more research into the quality of the soil and associated use, but also into the identity and experiential value of the sites. This recommendation is in line with the conclusions of a study conducted by the Brussels Agency for Territorial Development, which also acknowledged the temporary physiognomy of the L28 area as an important condition for the future urban development of the area [3]. In its more recent projects for the L28 area, Brussels chose for a dynamic approach to landscape urbanism, hereby challenging the assumptions about the landscape being a mere inert primitive lacuna or pause in the urban of development of its territory. In 2016, the Brussels Region commissioned a large-scale urban renewal project for the L28 area in Molenbeek and Anderlecht, Brussels. The project was assigned to a Brussels based consortium: 1010, Taktyk and Alive Architecture with Mariska Vogel and Caroline Claus (the first author of this paper). One year later followed the assignment for the design of a masterplan for the Weststation area to Taktyk, Alive Architecture & 51n4e, ABO, Tractebel + Idea & Caroline Claus & Les Eclairagistes Associé. Because of the expected duration of the project, the development of a Masterplan for West Station was supposed to be accompanied by the design of transitory processes for the future public railway park/places. Within this planning context, little attention is paid to the quality of the public sound environment. Proposed sonic approaches are limited to nuisance control [4][5]. From the perspective of the project developers and authorities, the health and peace of the future public space should be guaranteed. Conflicts over social noise nuisance are dealt with preventively and repressively in the short term, at street level. An exploration from the perspectives of young people and professionals involved, opened up to more constructible sonic approaches.

3. CONCEPT

Urban studies increasingly recognize sound as a medium for community building and political action [6][7]. Recent research in urban sound studies focuses on how collective listening practices help to develop a critical ear for urban space, thus contributing to productive reflection on future spatial plans [8][9]. Accounts of the sonic in terms of conscious hearing or listening are troubled by Goodman [10] in favor of an unconscious, affective account of sound as material impact, hereby opening up to the inaudible frequencies. Much of Goodman's work on sonic warfare is given over to determining a politics of frequency through describing experimental practices that intensify vibration, thereby unfolding the body onto a vibrational discontinuum that differentially traverses the media of the earth, built environment, analog and digital sound technologies, industrial oscillators, and the human body. Goodman[10:p.79) describes the vibrational nexus as each actual occasion of experience that populates the discontinuum, drawing in an array of elements into its collective shiver. The conception of a differential ecology of vibrational effects leads him towards a non- anthropocentric ontology of ubiquitous media, a topology in which every resonant surface is potentially a host for contagious concepts, percepts, and affects. In line with Goodman's ecological theory on sonic warfare through practice development, from an ecological perspective, we want to explore different possible engagements with acoustic force in public space and their possible effects.

4. TOWARDS A SONIC APPROACH TO URBAN DESIGN

Developing a sonic approach to urban design opens up to a more critical approach to urban design as we know it. How does constructive engagement with urban sounds and vibrations support the realization of people's existence (including ourselves) as part of a transforming social material environment ? How can urban sound designers contribute to a more inclusive urban transformation? How can they take responsibility in terms of negotiating, enabling relationships so that people can perform, move through, experience and negotiate the sounds and vibration of an urban environment in transformation? And by doing so, how can they establish a relationship with conflicting individuals, groups and thus the cultural, social and political context? Can they intervene in the urban environment by changing its sonic and or vibrational fundamentals or maybe just some elements? Can urban designers shape or contribute to inclusive urban space? What is the role of sound artists in this process of intervening? Can we connect disparate vibrational topographies with subjects, creating space for new understanding and experiences?

As a step towards a sonic approach to urban design this paper deals with the questions above by setting up a design perspective in line with Goodman's [10] ecological theory on sonic warfare, grounded in artistic and community engagement practices. Accordingly, different urban projects are used to show how sonic approaches may have an impact on public space design in a context of urban transition. These practices contribute substantially to our research project by highlighting new phenomena and methods for converting sound into a constructible quality. Resulting sonic approaches, methods and techniques will be taught and tested with respect to specific challenges in forthcoming urban design studios and workshops.

Sound Art and Artistic Research

Constructively dealing with sonic and vibrational material is not a new phenomenon. Our search for alternative, constructive, sonic strategies is supported and inspired by the work of artists and musicians making new aesthetic experiences and new ways (physical) mobilization developments possible. Avant- garde artists [11][12][13] explore in their work the possibilities of vibration and sound in urban space. Their work is situated at the crossroads of acoustics (landscape) architecture, urban planning, and actions for conceptual and experiential integration. Much of their work consists of research into the way vibrational and sonic events affect buildings, urban space and the bodies they occupy. Sculptural aspects of sound and vibration are investigated on how resonant materials, structures can define and thus manifest urban public space. The Sonic Rupture approach of Jordan Lacey [14], a practitioner-led approach to urban soundscape design, foregrounds the importance of creative encounters in global cities. Lacey considers urban noise as creative material and cultural expression that can be reshaped with citywide networks of sonic installations. The sonic and vibrational explorations of artists and researchers mentioned above show that sound and vibration can be approached in a positive way. Though it may difficult to apply them on an urban time/space scale, they offer valuable conceptual viewpoints, methods and tools for the design of sonic and vibrational interactivity.

Setting up an Urban Sound Design Perspective

In our attempt to set up a framework for a sonic approach to the design of the L28 railway area in transition, in what follows we sketch out five sonic approaches to public space design for sonic and vibrational improvement on different urban time/space scales. Interdisciplinary in nature, these sonic approaches comprise mental tools in the form of concepts, models and techniques for observing and defining sonic and vibrational interactivity in transforming urban environments.

In the *Articulation approach*, we develop a framework for urban design on the basis of identified sonic and vibrational qualities and physical constraints in a project area. Articulation is about playing the city via its design through the generation, modulation, and dampening of vibrational carrier waves of sonic affect. Contrasting earlier sonic models, such as R. Murray Schafer 'soundscape' or Pierre Schaeffer's 'objets sonores', which dealt respectively with large sound environments and very small sonic utterances, and the set of experiential features or 'sonic effects' as described by Augoyard & Torgue [15], within this approach, based on Goodman's ecological conception of the 'vibrational nexus', the body is understood as a multi fx- unit, as a transducer of vibration, becoming merely another actual entity in a vibrational event, assuming not necessarily any more significance than the resonances between other entities within this nexus.

By examining the experience of listening and being heard among those traditionally left out of urban research of community planning processes, sound artists and community based researchers define new ways of possible engagement with the complexities of urban environments in transformations. Recent work by Brandon Labelle [16] and MIT CoLab [7], for example, points to the importance of sound for political transformation.

Sonic Activism we understand as reaching out to, and activating the political potential of urban sound and vibration. It consists of an outreach based observation of protests, and other pertinent sonic and vibrational materials of urban social struggle, followed by a participatory translation of these observations into interventions offering shared imaginations for urban transformation.

Infrastructuring: Particularly in the last two decades a new understanding of infrastructures has emerged [17][18]. This school of thought rethinks infrastructures beyond their material and technical limits and critically reframes them as a part of the "urban social" and collective culture and space [19]. Building upon Neumann and Star's [20] and Star and Bowker's [21] work on making infrastructures, Karasti and Syrjänen [22] coined the term "infrastructuring". Infrastructuring is a process which involves infrastructure design for participation *"along with mediation, interpretation, articulation, actual design-in-use such as adaptation, appropriation, tailoring, redesign and maintenance.*" [23:p.57]. Recent research introduced the idea of design as an infrastructuring activity [24][25]. In this context, this approach reframes urban sound design as infrastructuring, rethinking the agency of ongoing spatial and sonic interventions to empower the communities to take part in the making and remaking of a particular vibrational nexus.

Sonic Augmentation we understand as the creation of a direct or indirect live experience of a physical, real-world environment whose elements are "augmented" by computer generated sonic vibrations. De Jong en Schuilenburg [26] explain how a lack of sensory input can be complemented by a mental apparatus or mental assumptions, executing computations following musical rules. Techniques like sound collage and sampling provide a basis for subtly designed semi- acoustic environments or soundscapes with particular spatial effects. For De Jong and Schuilenburg, sonic spatiality is not abstract nor neutral. The two authors define it as space for social relations in which specific stories, symbols and knowledge are shared, a spatiality which is different than the spatialities which appear to people in the physical city. "Surrounded by a 360 degree sound sphere, the listener always stands in the middle of a sonic spatiality. This center is not a static but a dynamic place. Everything moves and resonates through the simultaneity of different sounds. Pulses, tones, tapping noise, melodies and beats form a periphery which keeps the listener in its grip. Sound opens doors and passes through walls to make people move. The acoustic space of a sonic spatiality therefore has no rigid but soft boundaries. It is an ongoing becoming, or intensity where only extremes seem to be playing" [26:p.111].

In the following parts of our paper we introduce a few examples employing five sonic approaches to public space design introduced above.

Articulated Waves: The Zadar Sea Organ by Nikola Bašić (2005)

The Sea organ is an architectural sound art object and an experimental musical instrument, which plays music by way of sea waves and tubes located underneath a set of large marble steps. It was part of a larger redevelopment project for the north-western seafront of the peninsula in Zadar, Croatia [27]. The organ extends along a seventy meter front at the confluence of a newly created platform and marine parade connecting the seafront with the city. The organ's architecture consists of resolving the meeting with the water gradually, by means of a flight of broad white marble steps that go down beneath the waves. Understood as a rectilinear platform elevated above the water level, the stairs

support the dissolution of the border between land and water, hereby functioning as a kind of transit space. Not just a proper adaptation to the topography of the parade, the variations in the dimensions of the flights of steps also follow the musical line of the object, interpret as musical instrument. A series of polyethylene tubes of different diameters run along the inside surface of each flight of steps, connecting the submerged part with a gallery that runs along beneath the parade. The air pressure produced by incoming waves and pushed to orifices that connect the gallery with the surface of the parade, generates sound vibrations which, given the variations in the diameter and length of the tubes, cover a broad range of musical tones that can be listened to by people sitting on the steps outside the organ.

LA Listens, a collaborative project that explores sounds of urban vibrancy in Los Angeles by Wendy Hsu, Steve Kemper and Jessica Blickley (2017)

LA Listens is a neighborhood-engaged sound project using a multimodal methodology comprised of: community-based listening, soundwalk, sonic data analysis, and creative re-composition [28]. The project allows community-driven computational analysis of the permeable layers of LA's public acoustic territory [29] via the extraction of patterns from field recordings of cities, followed by creative re-compositions of city sounds from LA Listens team members and artists in the community. By closely listening to the field recordings, the researchers question the meanings of "vibrancy" and reflect on the role of motorized vehicles, pedestrians, conversations, street vendors in the multivalent soundscape of LA's neighborhoods. Additionally, using computational methods including Music Information Retrieval (MIR) techniques and sonographic data analysis, they search for underlying patterns in terms of sound events and periodicity in recordings. Integrating the data-driven and qualitative findings, LA Listens further wants to explore broad inquiries such as: What are the sonic characteristics of a dangerous intersection? What is the sonic identity of street-side vibrancy as defined various stakeholders including residents, urban planners, and city's officials? What is the sonic relationship between sanctioned and unsanctioned social activities? How do sounds (re)mediate neighborhood cultural identities? This research can be understood as a form of activism for two reasons: through community-driven analysis and sharing of sensory data, LA Listen wants to influence LA's urban development. Secondly, by sharing their data with artists, they want to activate a creative dialogue grounded in a co-production of reflexive interpretations of LA city's sounds.

Infrastructuring through Design: PASIONARIA by Emilio Lopez-Menchero (2006)

Since infrastructuring is an ongoing process by definition, while reframing it as a design activity, it is necessary to make a distinction between two different modes [30]: infrastructuring *in* design and infrastructuring *through* design. Infrastructuring in the design involves practices that allow various actors to contribute to the overlapping phases of the design and decision–making. A simpler formulation of this mode is the design of infrastructures which enables the facilitation of participation in design. Examples of these can be all kinds of communication tools and media that empowers the participants to contribute to the design process as an active participant such as platforms for crowdsourcing sono-spatial perceptions. Expanding this mode, sound can be interpreted as a metaphorical infrastructure for facilitating debates on and participation in design, making the act of

designing sonic environments an action of infrastructuring.

The second and the most interesting mode we introduce here is infrastructuring through the design product. This kind of empowerment takes place when various sono-spatial qualities of a design product enables the participants to continuously shape and reshape their own living environments. In this context, through design, it is possible to create infrastructures combining sound and space, facilitate different types of appropriations, and when possible enable adaptation and redesign referenced by Bannon and Ehn [23]. Essential qualities of this practice are the creation of products which are performative, reflexive and open to different sono-spatial appropriations.

The permanent intervention PASIONARIA by Emilio Lopez-Menchero, located at the beginning of Stalingrad Avenue, in the center of Brussels. Inaugurated on the occasion of 40 years of Moroccan immigration, this project is dedicated to all migrants. In parallel it refers to the speeches of encouragement delivered by the Spanish Republican soldiers in the trenches, on the battlefield [31]. This spatial intervention provides an open and reflexive metaphorical infrastructure for the voices of ordinary citizens to be amplified and encouraging them to participate in the debate. It can alternatively be used as a listening; interestingly, this function is hardly made use of.

In time, the Pasionara installation has been appropriated in different ways, and the surrounding space became a place of meeting and protest, extending the affordances of the intervention from being an metaphorical infrastructure to an actual facilitator of political representation. In this sense, the design approach of Pasionaria can be interpreted as an attempt at infrastructuring through design.

4DSOUND by Paul Oomen, Poul Holleman, Luc van Weelden and Salvador Breed (2007)

4DSOUND is a sound system conceived as a spatial instrument that can be played through integration with a range of interfaces and controllers allowing for evolving changes in three-dimensional positioning of sound [32]. One of the goals of this omni directional sound system is to enable visitors to experience spatial sound and immersive sonic environment. Another objective of 4DSOUND is to enable a social listening space in which listeners can move freely to explore a physical environment of sound, individually or collectively. As in the Philips Pavilion at the 1958 Brussels World's Fair [33], one of the earliest multi-channel installations, the experience of augmented sonic space in 4DSOUND is bound to the small space of the installation.

5. CONCLUSION

At the time of this writing the development of Brussels West Station comes in a next phase with the finalization of the masterplan. In this planning context, there is little concern for the quality of urban sounds. Suggested sonic approaches are limited to nuisance control. While noise and vibration regulations are necessary measures to limit exposure to nuisance, we consider them as inadequate for public space design. Nor do we find ourselves in the use of sonic arguments for a repressive policy against the presence of young people in the transforming public space of their changing neighborhood. Based on Steve Goodman's conception of vibrational nexus, the approaches and concepts presented in this paper reflect a way of thinking that embraces sonic and vibrational interactivity as a quality for urban design rather than a hindrance. They provide conceptual viewpoints, methods and tools for

more engagement, critical and spatial design, allowing us to explore the potential of sound and vibration for the design of transitional railway park/space in the Brussels L28-railway area.

We introduced five sonic approaches to public space design: Articulation, Activism, Infrastructuring, and Augmentation. We consider these as instrumental sonic approaches that can be used individually or combined. Instead of approaching sound and vibration as a threat to its surroundings, these design approaches make it plausible to see the potential of sound and vibration for the design of transitory processes for future public space. They suggest us to use what is dominantly considered as non-negotiable urban material, for public space design at multiple scales of time and/or space and to test scenarios for the evaluation of sonic and vibrational possible experiences in a changing spatial-temporal place. Most of the cases we present in the former section are situated at the scale of urban installations but contain strategies with a potential for urban design.

Articulation is about playing the city via its design through the generation, modulation, and dampening of vibrational carrier waves of sonic affect. It reframes the body as a multi-fx unit, as a transducer of vibration. The Zadar Sea Organ by Nikola Bašić is a clear case of articulation. This organ generates sound vibrations which create a broad range of musical tones that can be listened to by people sitting on the steps outside the organ. The case illustrates how by articulating the interaction between waves, air, cliff and people the design of an urban edge area can contribute to a larger urban project.

Sonic Activism was defined as reaching out, and activating the political potential of urban sound and vibration for new possible engagements with urban transformation. LA Listen we considered as a form of activism on the basis of its community-driven analysis and sharing of sensory data and ambition to influence LA's urban development.

Reframing urban sound design as *infrastructuring* requires a rethinking of the agency of ongoing spatial and sonic interventions to empower the communities to take part in the making and remaking of a particular vibrational nexus. Critical qualities for this practice are the creation of infrastructures which are performative, reflexive and open to different sono-spatial appropriations. The Pasionara case reviewed in the paper, indicates that these infrastructures can be metaphorical as well as physical with practical uses and they can be appropriated in the ways that are not intended by the designers.

Sonic Augmentation extends our understanding of spatial design towards the creation of a direct or indirect live experience of a physical, real-world environment whose elements are "augmented" by computer generated sonic vibrations. In this context we introduced 4SOUND, a spatial instrument that makes it possible to experience spatial sound and immersive sonic environment, individually or collectively.

In light of the above illustrations, a preliminary conclusion emerge regarding the scale of the sonic approaches presented. Particularly the last two examples are situated on the scale of an installation. They offer little perspective for large-scale urban design interventions in a larger complex city context.

In the near future (next year) the affordances of these approaches will be systematically explored further in the framework of a transdisciplinary studio and an elective course with the students at the KU Leuven Faculty of Architecture.

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TEXT / GROUND COMPARISON OF HOUSING FOR AUTOMOBILES

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Title: Text/ground comparison of housing for automobiles

Masha Hupalo

Keywords: infrastructure, planning legislation, fieldwork, parking, narrative

Format: presentation

This paper aims to give an outline of the methodology applied to the study of the parking phenomenon as a rare intersection of infrastructure networks, land use in metropolitan regions and technological mobilities. It starts with a discussion of urban planning legislation, and the power of its textual futures to reveal and conceal. Introducing attention to the acts of reading, interpreting and translating guidelines brings us closer to a notion of narrative. With the help of four primary case studies, I propose to treat an investigative process as a physical and textual conversation with the field.

Introduction:
Occupied Future

The plan is always an intention, a desire to be something else. Urban planning documents express general political ambitions of what the city should be, how it should look like, operate and appear in the media. To put this vision forward with the agile precision, the city is turned into a highly responsive entity to tune and alter according to a publicly accepted logic of development. In such a case, even if they skilfully pretend to be neutral, legal futures by articulating intentions bring into existence a distinctive normative universe of spatial variables. However, it is not only strict metes and bounds that find their way into legislative frameworks. We can see that how the urban futures in the planning documents become loaded with fantasies, aspirations, and fears, persuasively designed visions and cultural imaginaries (Maze, 2016, p.37). In this process, a system of rules and regulations develops into "the narratives that are the trajectories plotted upon material reality by our imaginations" (Minow, Ryan, Sarat, 1995, p. 96). These narratives hidden in the legal texts require interpretation. As Ann-Linh Ngo writes in the editorial of the issue of ARCH+ dedicated to the materiality of the law: "Laws merely indicate the basic direction; in the concrete instance, they must be applied, they must be interpreted" (2016, p.3). They conceal and reveal, they say important messages in between the lines and move dazed between ideas. In other words, the plan's ambiguity is its mysterious strength that largely lies in the balance of two main components – empirical measurements based on anthropometric data, and aspirational visions of the city to come. Their seamless interdependence gives them both authority and plasticity. It is in the process of articulating feelings and intentions that plans come up with futures that can invite us for further exploration.

Using this perspective, we can notice urban legislation offering a glimpse into the future field of the settlement and making it present in the present. By challenging a modern western perception of time being linear, the plans create temporal confusions and collisions. This unique relationship with time allows planning documents to avoid seeing and acting towards the future as outside. As they test a direction and a singularity of the temporal axis, they turn themselves into propositional feelings and start to exist outside time and space as "vibes towards the unattainable, a lure for feeling" (Parisi, 2013, p. 238).

Reading Plans:

Four Cases

In this line of thinking, the "past" textual futures emerge as a unique repository of values. They reveal and conceal, just like any other conversation partner. Therefore, a meaningful conversation with the field is both physical and textual, since the field itself can be reduced neither to the collection of prescribed and accidental artefacts nor the visionary plans. Such sort of fieldwork aims to distil a meaning out of seemingly abstract and predictive numbers and text on paper and compare these prescriptions to a present situation on the ground.

Due to the context-bound nature of the phenomenon of parking that is hard to carve out of the urban conditions a research method of explanatory case studies is the most suitable. This allows to combine and relate to each other a wide range of evidence of different character.

Among the sources of evidence that is needed to address the initial research questions of how parking planning, management and legislation can influence urban form one can find:

1. city planning documents, such as city- or countrywide general strategic frameworks, zoning codes, planning ordinances, parking requirements;
2. archival records, such as statistics on the density of residents, units and vehicles, records of the volume and location of parking infrastructures, images;
3. architecture drawings;
4. informative interviews with planners, architects, city officials, researchers, residents;
5. direct site observation;
6. information on current offers from real estate webpages and mobile applications for parking, its availability and price.

Along the way of collecting such diverse data sets, a research project develops a strategy of a "combination of pattern-matching and time-series analysis" (Yin, 1994, p.118). This approach meets the needs of thinking through the relationships between "independent and dependent variables" (1994, p.118) to establish logical models for further discussion.

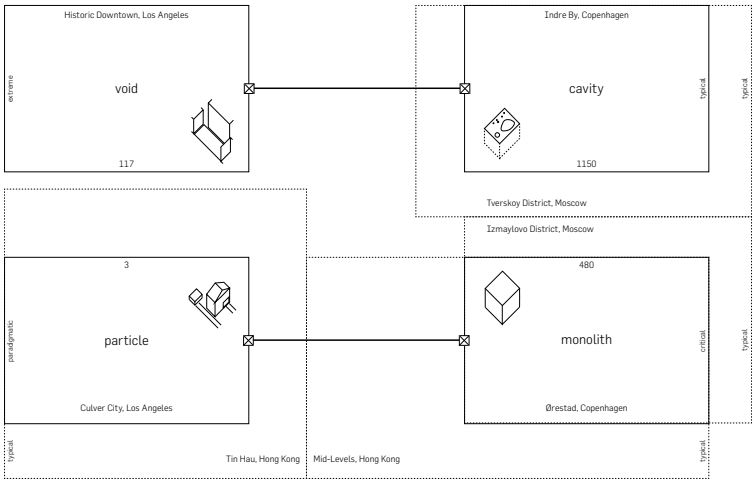

Figure 1. Key case studies

Central to the case study structure are four primary locations/sites/illustrations: two of them located in Copenhagen and two in Los Angeles (fig. 1). At the root of each of them lies a territory driven policy superimposed on an existing urban structure and laced together by actions of developers, architects, planners and residents. To investigate a diversity of legislation and its shaping power the cases chosen after a preliminary selective analysis represent different typologies of parking facilities: an underground "concealed" parking and a surface parking lot, a free-standing garage and an individual garage of a single-family house with an adjacent driveway. The research is structured as two comparisons - each time between two sites in two different cities, two different mobility contexts - and adorned with several descriptive cases to illuminate specific angles. These embedded units are used for replicating similar conditions in different locations and help in explanation building at the single-case level (Yin, 1994).

Figure 2. Surface parking lot in Downtown, Los Angeles

To start an analysis with probably the most familiar visualisation of car storage, we take a look at a surface parking lot in Historic Downtown of Los Angeles, which was practically abandoned from the late 1960s till the 1980s (fig. 2). But thirty years prior that parking lots were "part of an erosional pattern" of American downtowns (Jakle, p.96). The demolition of buildings to accommodate an increasing number of stationary automobiles intended to solve problems with congestion, curb side parking and help in competition against new suburban commerce. These new asphalt open spaces were straightforward and utilitarian - they were seen as "land banking", sanitised and ready for new development. A wide spread demolishment of deteriorated historical buildings mobilised preservationists and planners resulting in the draft of the original Adaptive Reuse Ordinance (1990). This policy concerned specifically downtown buildings in a commercial or R-5 (high density) residential zone constructed before July 1, 1974, and extended possibilities of their conversion. Most importantly it relaxed the parking requirements for an eligible building if it were converted to dwelling units, joint living and working quarters, guest rooms in hotels or a combination of them. No new parking spaces were required with existing ones had been reserved for residential tenants or turned public. The intent was to create a dense "24-hour city" with mixed commercial and residential uses, improve air quality and reduce vehicle trips. A few decades later a strikingly successful result is hard not to acknowledge, but it came with a price - a rise of land prices by as much as 400% since the early 2000s. Additionally, most of the suitable buildings have been already reconfigured, and highly skilled contractors are required for this kind of transformations. In this climate, ground-up developments on the former surface parking lots greatly

outnumber conversions.

Similarly, a large public square in central Copenhagen, Israel Plads (fig. 3), has been a surface parking lot for over 50 years before undergoing a recent renovation. Cars were placed underground in a three-level structure - as part of the city-wide parking strategy introduced in 2005 - and the surface was turned into a recreational landscape. More than a thousand car places allowed to remove a corresponding number from the city streets in proximity to Strøget pedestrian promenade, Nørreport train station and a neighbouring food market. An approach of consolidating automobile storage and, therefore, allowing shared use of the spaces throughout the day along with diminishing operation costs and promoting walking is a widely accepted urban strategy. One might consider looking at the changes in land use and density of activities, housing units, residents, vehicles, and vehicle trips to get a more nuanced picture.

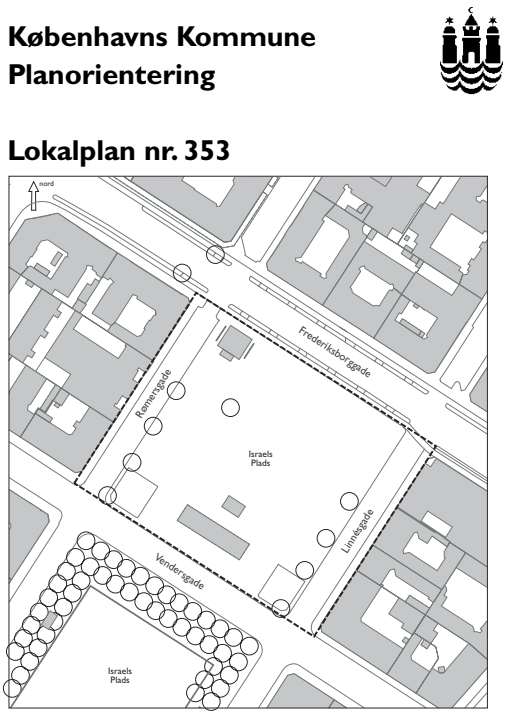

Figure 3. Local plan 353 for the development of Torvehallerne market in Copenhagen , next to the underground parking

Both of the above-described cases are centrally located parking facilities: one of them is an extreme case of a disappearing typology due to introduced policies, and another is a typical case of "hiding" and consolidating the storage of vehicles. The current investigation is an assessment of their effect on the surrounding territory regarding land use and density, their role in a neighbourhood mobility system, and a role of privately-owned parking operations and management companies - Joe's Auto Parks and QPark. Additionally, there is an embedded descriptive case of a centrally located courtyard in Moscow, where paid curb parking was introduced only in 2011. Pricing strategy and removal of the spaces made inner courtyards a valuable asset that residents defend by instilling physical barriers to guard a public space. This example is meant to enrich the discussion of managing the spill over effect that is inevitable in the early stages of parking reforms.

A second couple of primary cases reflects the treatment of automobile storage in transit-oriented developments (TOD), located within the radius of 800 meters from public transit and planned

according to notions of high-density and mixed-use. These ideas manifest themselves in Mountain Dwellings in Ørestad district in Copenhagen combining a multi-level parking garage for 480 cars and a layer of 80 apartments on top of it (fig. 4). It is one of six free-standing parking structures intended to consolidate vehicles of both residents and employees of the Ørestad area, that has a backbone of excellent public transit reaching Copenhagen Airport and Central Station less than in ten minutes. The modernist approach of planning the new linear town along the metro line and privately developed individual buildings come under heavy criticism for producing a low-quality urban space. In its current form, the site under investigation combines two identities: a shared, consolidated and mixed-use development in proximity of the Metro stop; and penthouse apartments equipped with individual gardens and no possible views of neighbours. In a way, it becomes a translation of the single-family house area situated across the street into a dense environment of Ørestad. A current analysis can be seen as a critical case of a still existing need to provide a possibility of living a car-dependent "suburbian" lifestyle even in the middle of the densest development in the most bike-friendly city. Similar challenges can be seen in new housing being built in Mid-Levels area of Hong Kong or a periphery zone of Moscow. It is of great interest to use these examples for illustrating how the needs of a middle class to own and store a car nearby are being met under different geological, legislative and economical conditions.

Figure 4. The Mountain Dwellings by BIG, Copenahgen

To characterise landscapes of car dependency, it is inevitable and essential to look at the plots of single-family houses in Los Angeles - the city with the highest density of parking spaces in the world (Shoup, 2005, p. 162). But when it comes to residents, its metropolitan area is also significantly denser than the New York or Chicago, probably due to the small size of the plots and a large number of family members in low-income neighbourhoods. In a situation of a severe shortage of housing, Los Angeles City Council adopted an Accessory Dwelling Unit Ordinance (ADUO) that allows homeowners to rent an already existing guest house, a smaller unit within a home or a converted garage. This becomes possible with an increase of maximum allowed size, an elimination of sprinkler requirements, a reduction of setback distances but most importantly a reduction of parking requirements in proximity to public transit. Garage apartments are supposed to introduce an almost invisible horizontal density and a more demographically diverse population to typical residential neighbourhoods. To conduct an in-depth examination of this paradigmatic case of a gentle transition, we will turn to Culver City elevated light rail station - one of the stops along the Expo line connecting Downtown to Santa Monica (figure 5). New TOD guidelines (fig. 6) promote

the transformation of the surroundings into a walkable area with ground floor level supporting commercial uses. But immediate surroundings are vast tracts of land dedicated to the single-family housing with potential for garage conversions. The ADUO can have a substantial formative effect in such areas and allow us literally to move from housing cars to housing people. As another example, we can take a brief look at a Dragon Centre Housing Complex in Tin Hau, Hong Kong, built in 1989 as a part of Urban Improvement Scheme and in compliance with minimum parking requirements. This extreme illustration of the densifying possibilities is useful in a discussion of the ratio between the urban space dedicated to vehicles and their owners.

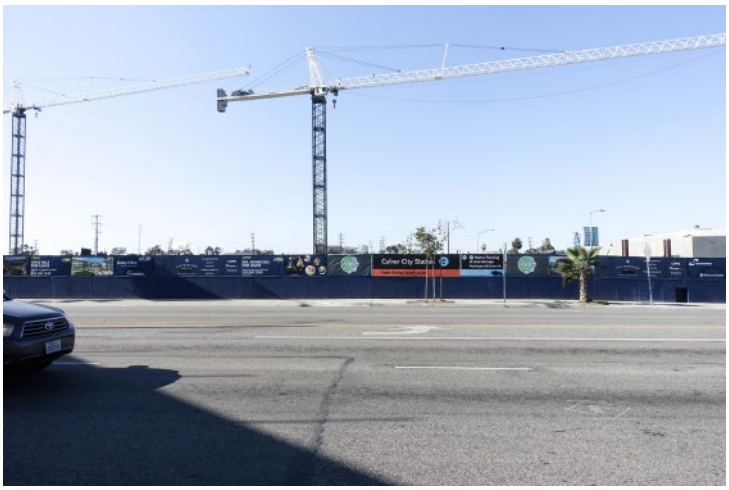

Figure 5. The future Culver City Station of Los Angeles Expo Line

Page 5

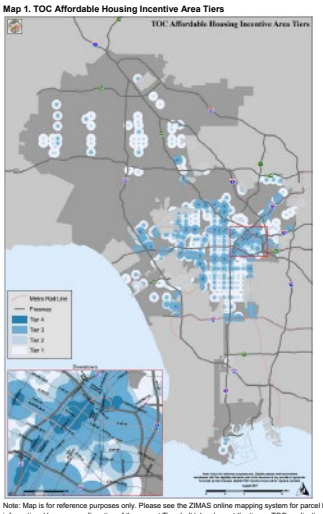

Figure 6. The areas with the biggest potential for Accessory Dwelling Unit developments, Los Angeles

Above described two primary cases demonstrate different approaches to combining the dream of an individual living and individual transportation with contemporary demands of living in compact communities served by public transit. What is essential for a current study is a role of spaces for car storage in this process? How can it be rethought and reconfigured in line with current demands?

Four primary case studies demonstrate an array of possibilities of parking infrastructures and their regulative legislation to change the land use and demographics, give space to additional housing and allow to preserve historical developments. Painting far-reaching consequences of such seemingly mundane infrastructural spaces prompts productive thinking about both spatial and non-spatial problems of a traditional city.

Negotiation Through Speculation:
Measurements and Visions

When examining these sites and their environment-worlds of legislation, market and daily choices of citizens what comes into the foreground is both the seductive and comforting role of planning guidelines. Generally speaking, design as a discipline finds its basis in changing present conditions to preferred and more desirable ones. One of the easiest ways to communicate an alternative vision, as we have already seen, is through the narrative of the legislation. This is where the civil rights activist and scholar, Robert Cover, introduces law as a "bridge in normative space connecting (our understanding of) the "world-that-is" (including the norms that "govern" and the gap between those norms and the present behavior of all actors) with our projections of alternative "worlds-that-might-be" (including alternative norms that might "govern" and alternative juxtapositions of imagined actions with those imagined systems of norms)" (Minow, Ryan, Sarat, 1995, p. 176). In this way, legislative narratives that shape urban futures can hide professional values from explicit view. What is put into the spotlight instead is the system of measurable parameters? Bernardo Secchi underscores the two-sided nature of urban planning tales:

> Within this multitude of texts in fact I recognize two opposite phenomena: the first is the tendency toward a progressive reduction of the urban planning tale, toward its coding and bureaucratization; the second is the unexpected appearance, in a specific circumstance or place in the tale, of an expansion, an increase of its thickness and density, and its ability to introduce new and more complex meanings than those readily apparent (D'Ambros, Secchi, Zancan, 2010, p. 113).[1]

These two elements – measurements and visions - do not exist one without another; in their tension, they form a unique speculative device that operates between code and vision, fact and thought, reason and imagination. In other words, planning legislation is both vague and precise, prescriptive and propositional, it exists in a vast territory between these two polar opposites. However, these binaries should not divide the image of the world and instead allow those who are affected by plans to work constructively on matters of mutual interest (Solnit, 2006, p.99). If crafted thoughtfully, they can produce seemingly small disturbances that alter complex systems of decision making. Together they form a speculative device of urban planning that facilitates the practical investigation of the social world. As a well-functioning device, they can not operate in isolation. By definition, the device is "always in relations that are themselves always being reconfigured" (Lury and Wakeford, 2013, p.9).

What exactly does this discussion have to do with a planning document? At a fundamental level,

[1]An English translation of Bernardo Secchi's reply to the planner and theoretician Pier Carlo Palermo, who wrote a review of his book "Il raconto urbanistico" (1984).

regulatory framework can be seen as a repository of all sorts of relations that thicken possibilities and invite speculation. [2] The experience of these relations involves the transition between given potentials and unknown events (Parisi, p.235). This speculative transition, however, is not straight forward. Alfred North Whitehead compares the method of speculation to the flight of an airplane which starts from the observation and lands for the observation and in a process is "rendered acute" in the "air of imaginative generalisation" (Whitehead, 1978, p. 5). Ideally, a planning guideline prescribes fundamental building parameters and simultaneously offers a description of the new social realities to imagine, accept or decline and transform initially defined rules accordingly. It becomes an intricate thought experiment that opens to view the complicated variables of the future urban fields. These plausible futures do not even have to be realised to influence expectations. Their value lies in permitting to imagine opportunities and come to terms with previously not experienced reality.

Conclusion:

A current research project aims to couple the typological analysis of different parking phenomenon and their formative role in forming cities with the discussion of the method of speculation, applied to narratives – be it planning legislation, promotional videos, or critical fiction. Speculation and strategy become complimentary modes of transforming surroundings. The site-specific conditions and characteristics of each parking infrastructure dotted all over the world show a remarkable cohesion as much as diversity. From a confused whole of each of them, I am on the way to determining how to distinguish material and immaterial things that form this seemingly mundane matter of concern and matter of care[3] storing automobiles.

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[2] Luciana Parisi articulates how a speculative method coincides with both - the notion of abduction coined by Charles Sanders Peirce and further developed by Alfred North Whitehead; and radical empiricism of William James (p. 234).

[3] In his essay "Why Has Critique Run Out of Steam? From Matters of Fact to Matters of Concern" (2003) Bruno Latour advocates for a new kind of critic "who assembles" and "offers the participants arenas in which to gather" by engaging with matters of concern and caring for them.

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THE CITY AS A BOARD GAME
TOWARDS AN ASSEMBLAGE REPRESENTATION OF THE URBAN

KIM NØRGAARD HELMERSEN AND
DR. JAN SILBERBERGER

The city as a board game: Towards an assemblage representation of the urban

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Critique of the master plan: An evolutionary perspective 4
The city as a board game: Towards an assemblage representation of the urban 5
Developing the possibility field as a board game 6
Introducing the players 6
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The image of the city as a board game 9
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Closing remarks: The board game study as an illustrative case 10
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The city as a board game: Towards an assemblage representation of the urban

In a philosophy of science perspective architectural ideals are typically characterized by concepts that include the individual idea and subjectivity (Kurath 2015). As a result, the traditional design studio tends to simulate the design competition, with students working individually on competing future visions for a selected site. This approach is challenged in this paper, presenting early findings from an STS-inspired research study of architectural design teaching at The Royal Danish Academy of Fine Arts, School of Architecture (KADK). Investigating research potentials in design practices at the school, the aim of the research study is to describe these practices and investigate their research potentials.

Presenting an example from the on-going fieldwork, it is argued that urban design teaching could benefit from the imagery of a board game, substituting the concept of the 'master mind' with a number of heterogeneous players, competing about and negotiating urban form[1]. As a design instrument, the board game anticipates actor-network theoretical perspectives, and presents early steps toward an urban design method, with potentials for further investigation and development.

Belonging to what Michael Batty and Steven Marshall names the 'evolutionary paradigm' (Batty & Marshall 2009) in urban planning and design, the paper broaches the idea that cities evolve into an unknowable future, meaning that any objectives or visions that the urban designer might have for the future 'are contingent on the present, hence continually subject to revision and compromise (Batty 2008)'. Building on this argument, the paper questions the finite quality of the traditional master plan, and argues for a more performative approach.

Two paradigms in modern urban planning

"In contrast to the developmental paradigm, which treats the city as a whole entiry that develops over time, and whose optimal form is knowable in advance, the evolutionary paradigm allows us to appreciate the organic qualities of cities, without implying there is a fixed relationship between the parts and the wholes, or an optimal mature form (Batty and Marshall 2009)".

In an insightful paper, Batty and Marshall differ between a developmental paradigm and an evolutionary paradigm in urban design. While the ideological basis for the developmental paradigm can be traced back to the renaissance, the evolutionary paradigm can be traced back to Charles Darwin via complexity theory (Batty and Marshall 2009).

The principles of the master plan

'Ever since urbanists began to map and describe the city, the language of the human body has been used to describe urban form and to suggest ways in which cities might be planned (Batty and Marshall 2009)'.

The historical development of modern urban planning is closely linked to a concept of functionalism. In the Italian renaissance the city was understood and depicted as a human body – a complex system, held together by an equally systematic order. As a result of this interpretation, it became the task for the planning architect to understand and reveal that underlying order, holding together the parts of the city-body, potentially optimizing its functionality (Sennett 1994). With the introduction of the perspective drawing, it had become possible to draw the world in Man's image, who (created in God's own image) was believed to have privileged access to knowledge (Hill 2013) (Sennett 1994) (Gifford 2003). In this way, a renaissance concept of planning was built on two assumptions: "First the existence of an underlying, externally defined order, (…) waiting to be revealed, and second, that it's the planners responsibility to discover and reveal that order" (Gifford 2003).

Further, in his most insightful study, *Design research: the first 500 years*, Jonathan Hill argues that it

[1] The study is based on participant observation at crits over the course of the studio in the fall 2017 as well as interviews with leading design teaching Ida Flarup and students

was 'the command of drawing – not building – [which] unlocked the status of the architect, establishing the principle that architecture results not from the accumulated knowledge of a team of anonymous craftsmen working together on a construction site but the artistic creation of an individual architect in command of drawing who designs a building in a studio (Hill 2013:15).' This discourse established a relation where architects asserted their intellectual status by making 'drawings with just a few delicate lines […]. Whether in the studio or on site, they tended to see not matter and mass but proportion and line (ibid)'. It was the idea, not the craftsmanship, which gave the architect his privileged position and in this way, a third principle for a renaissance concept of planning can be added. It was because of the urban planner's access to the 'world of ideas', established through his drawing expertise that he was considered able to reveal the underlying order of the city. Building on this body-mind dualism, concepts including the individual idea and subjectivity developed as ideals for an architectural and urban planning practice.

In modern age, urban planners belonging to the development paradigm famously includes Ebenizer Howard, Le Corbusier and Oscar Niemeyer, who each tried to solve social problems in the modern city by design. While presenting different visions for the future city, these scholars shared a top-down approach to urban planning believing that an optimal city could be fully shaped by Man. Chaotic conditions in cities of the industrial age had created a mistrust in the 'natural' forces of urbanity, with people desperately looking for answers to how order could be re-established in the city. Famous master plans such as Howard's Garden City (1898), Plan Voisin by Le Corbusier (1925) and Brasilia by Niemeyer (1956) can be seen as answers to this problem of urban disorder (Goodall 1987) (Le Corbusier 1985, 2011) (Westin 2014) (Holston 1999).

Critique of the master plan: An evolutionary perspective

'A city is not so much like a growing organism, where the mature adult form is roughly knowable in advance, and deviations from which are assumed to be harmful. Rather, urban change is more akin to an unpredictable evolution, with the city a system of co-evolving components (Marshall and Batty 2009).'

While inspired by biology, the works of the modernist planners could at best be analogously associated to evolutionary theory, although Charles Darwin was an inspirational source to Le Corbusier[2]. Quite the opposite, they seemed to echo a metaphysical past, dating back to the renaissance and the idea of Man as rational and nature irrational, geometry as a universal order and the planner as the key to the realization of such order (Rasmussen 1957).

As argued by Batty and Marshall, to apply a Darwinian approach to problems of urbanity would be to understand urbanity as 'a multitude of bottom-up decisions, which while realizing coordinated and ordered patterns, produce shocks and abrupt changes in ways that are intrinsically unpredictable (Steadman 2008:187) (Batty and Marshall 2009)'. Instead of departing from a mistrust in the order of urban, scholars belonging to the evolutionary paradigm takes a supposed intrinsic order of the urban as their point of departure. Believing that social problems indeed *can* be solved by design but that the outcome of a design *can never* be predicted, they believe in vernacular urban transformation forces to be constructive in an intrinsic manor, studying how the parts come together in essentially unpredictable, whilst not arbitrary ways to form resilient social structures.

When Jane Jacobs in her pivotal work *The Death and Life of Great American Cities* (1963) introduced

[2] Le Corbusier believed in the universal design, and found it in a number of *object-types* representing higher forms of 'selection' than other types. Certain objects such as the tobacco pipe were seen as 'end-products of processes of technological evolution (Steadman 2008:129)'. In explaining the selection of these design-objects, Le Corbusier drew on Darwin's evolutionary theory, describing how they represented a form of revolutionary end-state – equilibrium. In doing this, however, Le Corbusier found himself in a difficult situation, since a Darwinian formulation of evolution would give account to the factor of random mutation, finding that 'variations in the form of the artifact were introduced accidentally or at least without any very great measure of forethought (Steadman 2008:131).'Prescribing these object-types of higher evolutionary status, Le Corbusier thus came to argue from a distinctly qualified position, finding that only 'objects which conform to certain pre-established formal criteria, of simplicity, geometrical purity and so on [could be named object-types] (Steadman 2008:187)'.

the concept of 'organized complexity', she described an urban functionalism, which didn't lay in the hands of the planner, but immanent in the urban nature. Through street-level studies, she argued from bottom-up how for example simple surveillances in the local, of people sitting in their windows observing street life could emerge into the global phenomena of urban safety. This image of the city as a self-organizing organism via a multitude of heterogeneous, often conflicting but essentially related actions is akin to an evolutionary concept of the urban, resulting in a contrasting view on urban design (Jacobs 1992).

From the perspective of evolutionary theory, the traditional notion of the master plan can be criticized for having misinterpreted the problem at hand, believing in a fixed relationship between the parts and whole of cities, thus creating solutions, which proves unable to withstand evolutionary time (richardsennett.com). As argued by Batty, cities were designed in a timeless future 'where sets of objectives have been defined to be achievable as if the city was cast in timeless web, and it is of little surprise that few cities have ever achieved the aspirations set out in their plans (Batty 2008)'.

While the finite understanding of cities of the developmental paradigm have been challenged over the last half a century, the logic of the master plan still holds a central place in urban design teaching, with students working individually on contesting urban plans, simulating the traditional design competition. While such plans are often attempting bottom-up designs, including knowledge derived from on-site investigations, they have one issue in common, harshly criticized by actor-network theory: they are static objects, rather than moving projects, presenting a design as an end-solution rather than a movement. The finite quality of the master plan means that it describes only the already actualized, while overlooking the virtual, which according to Gilles Deleuze and Felix Guattari is equally 'real'. It *is* something, rather than *does* something (Latour & Yaneva 2008) (DeLanda 2015).

Arguably, the introduction of an evolutionary perspective in architectural and urban design education is challenged by the quality of traditional forms of architectural representation, which portrays a design as an 'object', rather than portraying its performativity. This leads to a question of *how one can incorporate temporality into the representation, bringing the urban design project and its context of human and non-human relations 'on the move"*?

In an urban design class recently encountered on a fieldwork at KADK, I encountered an urban design studio exploring answers to this question. In an assignment that drew loosely on Deleuze's concept of 'assemblage', the concept of the 'master plan' was challenged, with students negotiating the development of urban form, rather than working individually on contesting urban visions.

The city as a board game: Towards an assemblage representation of the urban

As part of an on-going field study of architectural teaching and research, I was recently a participant observer in an urban design studio at KADK. In this studio, the urban was depicted as a heterogeneous landscape, constantly emerging through negotiations between different urban impact factors. Recognizing the agency of such impact factors, the concept of negotiation became an epistemological departure point for the assignment – an entry into the understanding of the urban site as a 'possibility field' asking: how can the site be explored as 'doing' something? And how can this 'doing' be represented in the design studio?

In order to bring temporality into the equation, working with an urban context that acts by negotiating actively with the design project, the site was constructed as a negotiation field, introducing a number of non-human actors influencing the selected site. Challenged by the questions above, the students started investigating this site – a harbour area in the town of Køge, south of Copenhagen, which is currently undergoing a profound evolution. Their investigation focused on four impact factors, which they, divided in four groups, would investigate, map out and afterwards represent in their negotiation of the harbour area as a possibility field, leading into the development of one big model of a potential urban structure. The four different impact factors, selected by the design teachers, each operated in specific ways and it was the first task of students to investigate the behaviour of these impact factors, before trying to operationalize them into operative architectural typologies.

Based on these on-site studies, students built a number of models – instruments – that represented the character of each of the four impact factors, and the ways in which they shape space. The instruments were material translations of the characters of the four impact factors, and resulted in the models

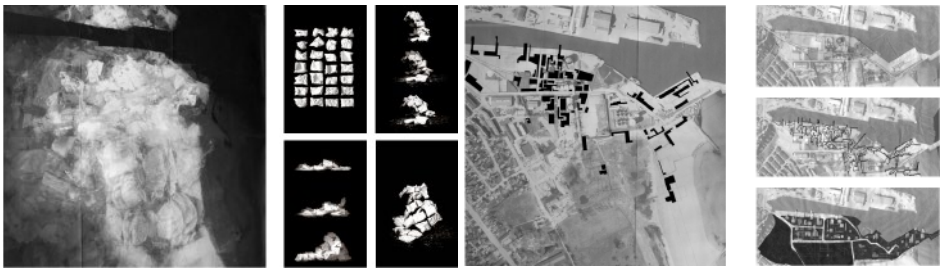
below, representing: 1) wasteland, 2) transformation, 3) the future and 4) heavy industry (Winther, Goldinger, Ougaard & Vaagslid:2018).

Developing the possibility field as a board game

At this stage, the assignment was taken further, as the students decided to frame the possibility field as a board game, in this way re-writing the assignment in collaboration with the design teachers. Besides structuring the negotiation process, students found that developing the possibility field as a board game could be a productive way of working with another important aspect of the studio – the factor of chance.
In this way, the four different groups would represent each their impact factor in rounds of playing, taking on their individual qualities as they participated in the game with their physical bodies. The rules of the game were decided in rounds of negotiation with both students and teachers included. As a result of these negotiations, the possibility field took form as a classic dice game, bringing the factor of chance into play.

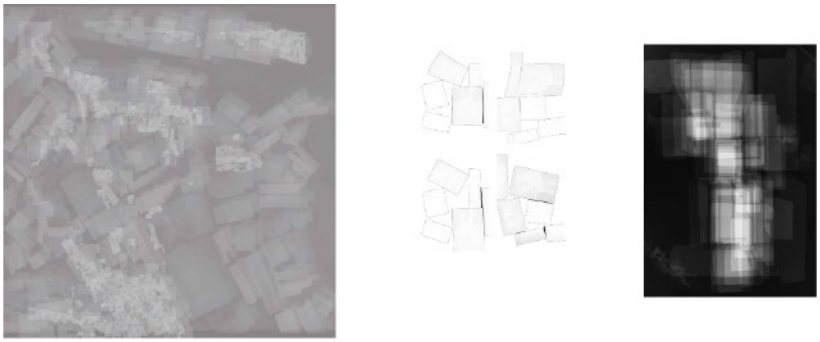
Based on their preliminary studies of the four impact factors, they were further developed into players, which would move in different ways according to the number of eyes shown by the dice, as it was tossed in rounds after turn. To all four players, and for every number of eyes, was defined a number of fields to be moved and the quality or character of the move.

Introducing the players



The wasteland (see images to the left)[3] is a regenerative and heterogeneous organism, autonomously growing without direction or intention. Depending on the number of eyes shown on the dice, the wasteland unfolds, sneaks around or squeezes through.

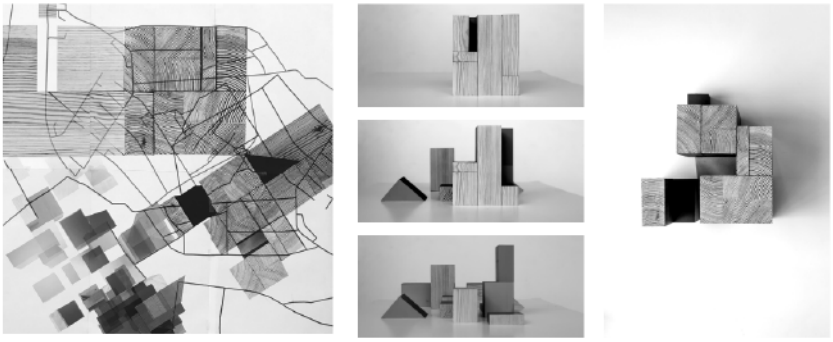
Transformation (see images to the right)[4] balances the existing and the idea. It departs from an existing field, and mediates change processes, bringing the existing into the future. Depending on the number of eyes shown on the dice, transformation either doubles, rotates, reduces, shifts, dissects or mirrors.



[3] Source: (Winther, Goldinger, Ougaard & Vaagslid:2018)
[4] Source: (Winther, Goldinger, Ougaard & Vaagslid:2018)

The Future (see images above)[5] deals with the changing nature, and for every 5th move of the future, there is *the flood* – a context-specific effect of climate change, more frequent and less predictable than ever before. Depending on the number of eyes shown on the dice, the future either shifts or lifts.

Heavy industry (see images below)[6] works top-down with great impact, characterized in shape and size by its logic and function. It places itself in the field as a monolithic giant and is only dissolved in one of two strategies when clashed with a neighbouring actor. Depending on the number of eyes shown on the dice, in relation to neighbouring actors, heavy industry collapses as either fabric (a structure within) or grid (a structure around), referring to different levels of rigidity that the industry imposes on the field.



The probability attached to each of the players was defined by the preliminary studies of the impact factors. For example *the future* was believed to lift 50 percent of the time, and shift 50 percent of the time, thus arriving at a 1:2 probability with 1-3 eyes = shift and 4-6 eyes = lift (Winther, Goldinger, Ougaard & Vaagslid:2018).

The course of the game

Over the course of the game, as interactions become increasingly complex, the overall complexity of the space increased showing how the urban is formed in processes of negotiation and chance. When the game starts, possibilities are high and complexity low, but as the game is played, by each strike, complexity is rising as players come together to produce form, filling up the possibility field.

However, to decrease this complexity, and gain some control over the growth processes, by the end of each round of playing, students would gather to negotiate the overall spatial outcome of the round. Still staying in their characters, thinking and negotiating with the 'mind-set' of their players, the overall structure was negotiated creating a form of hermeneutical process between playing, and zooming out to consider the outcome of playing.

Thus, the game unfolded in the field between negotiation, strategy and chance, constantly releasing and restraining growth processes as the game went along. After a number of rounds, which had not been specified prior to starting the game, the students collectively decided to stop the game. This decision was based on a collective evaluation of the last rounds of playing, where changes to the built structure became less and less dramatic, with only transformations of the existing structure taking place. The movement of the building mass had reached a less dynamic, more stable stage, and it simply made sense to stop the game, all the while acknowledging that the game obviously wasn't finished, since architectural growth and transformations processes can never really be finished.

Applying a deleuzian ontology

'Assemblages are not governed by any central head: no one materiality or type of material has sufficient competence to determine consistently the trajectory or impact of the group. The effects generated by an assemblage are, rather, emergent properties, emergent in that their ability to make something happen is distinct from the sum of vital force of each materiality considered alone

[5] Source: (Winther, Goldinger, Ougaard & Vaagslid:2018)

[6] Source: (Winther, Goldinger, Ougaard & Vaagslid:2018)

(Bennett 2009:24)'.

The image of Køge as a 'possibility field', which was later transformed into the board game, could easily have been mistaken for a 'possibility space' – a notion derived from Manuel DeLanda, who famously interprets the works of Gilles Deleuze and Felix Guattari. While only loosely inspired by Deleuze's theory, there are invisible links to complexity theory in the way the urban design studio was established and developed in a negotiation between teachers and students. Of this reason, and to draw a possible direction for a future conceptual development of the board game approach to urban design, a few concepts from DeLanda's complexity theory shall now be introduced, and put in relation to the board game study.

When you choose to structure a study of urban growth processes as a board game, it is perhaps because you realize that the material world consist not only of what already *is,* but also what *might become,* not only of the *actual* but also of the *virtual* (DeLanda 2015) (Abrahams 2016).
Following DeLanda, a deleuzian ontology allows you to consider the material world in exactly this way, describing not only the 'beings' of things, but also their 'becomings'. For Deleuze reality is much more than the actual world, we see around us. Also the so-called becomings are pre-actual parts of reality – a form of virtual reality. Or as DeLanda puts it, 'there is no such thing as "reality as it really is" because reality changes, there are innovations, multiple levels of emergence, and unpredictable capacities to affect and be affected (DeLanda 2015)'.

In this connection, Deleuze speaks of an actual realm and a virtual realm, as two extremes with a line in between (figure 1). In its extreme form the actual realm is problematic because it suggests that the objects we see around us can be studied as fixed beings with clear traits. 'But also the extreme virtual realm - a collection of 'pure potentials' – would be no less abstract and reductionist (Abrahams 2016)'.

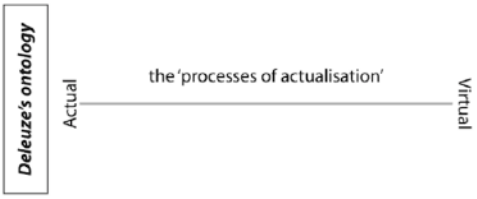


Figure 1: Deleuze's ontological structure (Abrahams 2016)

Instead of giving these extremes an ontological status 'Deleuze sees the two realms as functional devices, helping to imagine a theoretical line connecting these two points describing the 'processes of actualization'' (ibid). Such 'processes of actualization' pose the ontological structure of an assemblage theory, and the possibility space refers to an exploration of these processes. In my view, the board game creates such possibility space – an arena for the study of 'processes of actualization'. And the reason we need such possibility space, not least in urban design, is precisely because of the difference between what DeLanda refers to as properties and capacities of material objects.

While 'a knife may be sharp (a property), it also has the capacity *to cut'* (DeLanda 2015). This means that besides their properties, material objects are characterized by their capacities to affect and be affected. Capacities, though, are relational, so the knife's capacity to cut, 'must be exercised with something that has the capacity *to be cut* (cheese or bread, but not a solid block of titanium) (DeLanda 2015)'. In this way, DeLanda explains that while both properties and capacities are real, 'properties are always *actual* (the knife is either sharp or dull), [but] capacities are only actual when they are being exercised. Most of the time they are only potential (or *virtual*). (DeLanda 2015)'.

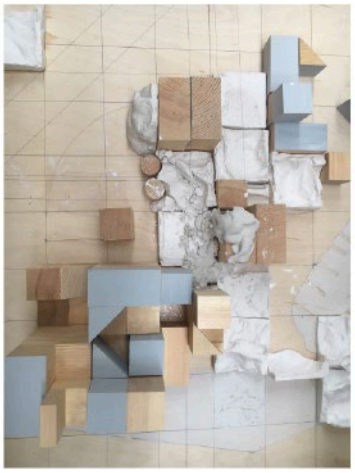
Thus, to understand and explain material objects in terms of both their properties and capacities, an architect or urban designer needs to study their performance in action, in relation to other objects. Hypothetically, this could be in 1:1 scale or in practice of a test laboratory, simulating potential processes of actualization.

Bringing an example of a 1:1 study of capacities of materials from building architecture, Peter Zumthor

in his famous book on *Atmospheres* (2006) describes how he was surprised by the material compatibility of a soft ceder material, he used for surfaces in an exposed concrete building. In spite of his undoubtedly firm knowledge and experience of material compatibility, he didn't expect a matching effect of the two materials. He thought the soft cedar tree would be too soft. But when he put the materials in relation to each other, in the actual context, it turned out the cedar tree had no trouble fitting in. As a result, Zumthor removed the rosewood, which he had first expected would fit in, and installed the soft cedar tree instead (Zumthor 2006:24ff).

As an example of the latter, the board game presents an ideal type test laboratory simulating an urban complexity in action, studying its properties and capacities as they actualizes through (unpredictable) interrelations. The four urban conditions, which turned into players in the board game, were each characterized by a number of properties, which had been determined based on previous studies in Køge. But in addition to these properties, predictions were also given as to how the players would potentially interrelate with other players, through a description of their capacities. Each of the players held a number of capacities, which could only be studied *in action,* in interaction with other players with matching capacities. The wasteland, for example, is described as regenerative and heterogeneous in its properties, and it has the capacity to unfold, sneak around or squeeze through, when interrelating with other players. The images below illustrate processes of actualization, with the four urban conditions interacting in various ways, catalysing emerging capacities of these, creating urban form[7].

Further, by turning the city into a board game, adding the factor of chance to the production of events in the possibility space, an account is given to 'evolutionary time'. While the capacities of players are pre-established in the concept of the game, their actualization through interactions with other players are subject to chance and thus essentially unpredictable, preventing a pre-determination of form.


The image of the city as a board game

When you decide to image the city as a board game, obviously the first question you'll ask yourself is which game do I want to play? And why?
In the present example, the board game was developed as a classic dice game, partly because it was simply the most well-known and simple game design, and partly because the students wanted to play with a high factor of chance. Besides the essentially unpredictable outcome of any game, which rises from the lack of ability to fully predict the strategy of competing players, dice games holds the random element, which further increases complexity. In the dice game, chance takes part of the game as an external 'player', or an externality, as described in microeconomics. It is that non-strategic action, or breaking of the rules, which is not included in classic strategy games.

Working with randomness in relation to design is interesting as it breaks with the idea that the appearance of the material world can be reduced to intentional action caused by 'subjects', such as the architect. On the contrary, design processes are very often influenced by randomness caused by unforeseen, and often overlooked, externalities such as sudden cases of illness, climate change or

[7] Source: (Winther, Goldinger, Ougaard & Vaagslid:2018)

simple misinterpretations (Yaneva 2009). Introducing the dice could be one way of including such element of randomness. However, this element could also have been included in a card game, where specific cards could disrupt a game otherwise structured by strategic decision. And it is obviously the next step for a development of the board game to bring it in relation to other types of games used in urban development, marking its position in relation to existing literature on game theory.

Laura Varnaez, for example, has combined Space Syntax theory and method and game theory to describe ways through which decision-making processes can be 'spatialised'. Describing how games can be either cooperative or non-cooperative depending on the rules established, she has studied the spatial configuration of Southbank in London as a game of chess. In this game, she studied how people were using different strategies to move forward, shaping and re-shaping paths in the area (Narvaez 2014:6). Unlike the board game, this game does not have pre-defined rules, and it is played by individual actors competing with one another. Re-building the board game as a game of chess and playing it at the same time as the original dice game, observing the development of both could be one way to further investigate the qualities of different games against one another.

The board game as a teaching and design research instrument

While the board game as a design research instrument is obviously in an early phase of development, it presents a challenging way of imaging urban form. Always subject to the inevitable factor of chance, the board game presents urban growth, as it is – complex and essentially unpredictable, while not arbitrary. This approach is in line with an evolutionary reasoning, which describes urban growth as essentially unpredictable and uncontrollable, whilst not arbitrary or destructive. From the standpoint of assemblage theory this means that one needs to work with urban conditions, not only in terms of their existing properties (the actual realm), but also in terms of their pre-existing capacities (the virtual realm), by looking at how these actualize in interaction with other players. Within the framework of the board game, such studies have been made possible.

Besides challenging traditional planning approaches, the study also presents an alternative approach to design teaching and research, which it has been inspiring for a design research scholar to follow. With the introduction of the board game as a design research tool, traditional ideals in architecture – including the individual idea and subjectivity – are substituted by a collective process of conflict and negotiation. The students taking part in this design studio didn't draw a set of individual competing images for how an optimal urban form could be or should be, but instead they designed an instrument in collaboration, which simulates actual processes between presence and future. By doing this, they took studies of the problem at hand – an urban complexity – as departure point for the shaping of a design research instrument. – An instrument, which anticipates actor-network theoretical perspectives on architecture- and design practices, by introducing the design process as a series of events involving a multitude of heterogeneous actors of human and non-human character, negotiating the synthesis of form (Labour & Yaneva 2008). In this way, the board game unfolds as a performativity, existing only *in action* and thus bringing a temporality into the representation of form.

However, at this stage of development, the board game has not reached a status of an actual design instrument. Challenged by demands of individual work and examination, the board game study of Køge was limited to forming a research phase in a larger semester project ending with a number of individual studies. Motivated by positive students evaluations, perhaps the research study could be expanded in the future, and the potentials of the board game as an actual design instrument further explored.

Closing remarks: The board game study as an illustrative case

Albeit loosely inspired by the deleuzian concept of 'assemblages', the urban design studio didn't depart from any specific theoretical or methodological position, instead establishing the studio as a form of experiment (Winther, Goldinger, Ougaard & Vaagslid:2018). When I first visited the design studio the development of the board game study could not be related to any existing research agenda at the school, nor was it anyone's ambition to form it into a research method.
To my knowledge, the study had developed solely on the basis of practice-based decisions taken in relation to the problem at hand, with a form of case-specific technique or method developed in a

continuous negotiation between students and teachers. In this sense, even the learning objectives of the studio could to some extent be transformed over the course of the studio, in negotiation, not only with the teachers, but also with the study 'object' – an urban complexity calling for less essentialist and deterministic approaches.

While such case-sensitive approach is in no way unique for an art academy, such as KADK, where singularity in both method and design is a pursued objective, the board game study presents an innovative approach in that it challenges traditional architectural ideals by suggesting multiple authors as well as questioning the representation of the urban.
In this way, the study has served as an illustrative case example for my research study in design teaching and research of how the practice-based approach pursued at KADK can carry research potentials, and push existing theories and methods. But also how these research potentials are often falling under the radar, as practice-based studies are rarely being put in relation to theory.

Arriving to the design studio as a design research scholar, I plead guilty in having brought the practice-based research in relation to theory, pushing towards a research production. My sole presence during critique situations has most likely influenced the path discussions took, perhaps towards a debate of the research potentials of the design studio. By drawing attention to the research potentials of the study, the ambitions for the board game might have changed, and theoretical reflections on its present state and future potentials set in motion. Whether this influence has been productive or perhaps destructive is not my question to answer, but my participant observation in the studio gave me an insight into architectural practice and theoretical reasoning as different work-modes, their individual qualities and how these modes might (not) be combined.

Whether to combine these work-modes, as in the form of a merging, or a constant dialectics, or to keep them separate and instead establishing platforms for dialogue, I cannot say at this point. But I believe in the potentials for developing some of the basic components of the board game approach to a more general method for teaching and research in urban design. Besides breaking with the traditional image of the 'master mind' in urban planning, it presents an alternative format for the urban design studio, questioning traditional notions of design and representation.

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GROUNDED THEORY AS METHOD; EXHIBITION DESIGN AS MEAN

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Full Paper (7000 words)

Introduction

The relationship between the modes of production of architecture and the dominant economic system has been crucial in the research field of `Architecture and Labour´. The professionalism in architecture is a recent concept that reached dissimilar phases in each countries[i], whose definition oscillates between "a benevolent profession, a market practice, or a field of cultural production".[ii] As example of how controversial - but even close, real and urgent is the topic - we could consider the arduous rapport between money and architects. For the majority of professions, money is the abstract medium to exchange a service. Some architects, instead, have a sense of existential "guilt" in asking money, that results in negotiating conditions which are usually below what they deserve.[iii]

However, architecture is a profession that needs money to be realized and, being a liberal profession, it is finalized for the production of an economic turnover[iv]. Focusing on the mode of production within the drafting rooms: on one side, the architectural historians have debated the organization of practices according to the specific labour organizations (atelier-based, Fordism-based, corporations, …); on the other side, practitioners have challenged economic shifts using new mechanisms and strategies for procurement.

This paper emerges from an ongoing Ph.D. research "The Labourification of Work: behind the scenes of the contemporary modes of architectural production in Denmark"[v] in the field, and it has been crucial in conveying issues related to the methodology in a chapter of the final monography. In relation to the content, it is framed in a section of the dissertation related to how the Danish architectural practices have been affected by a series of events in the political and economic scene of the country (1993-2016). It focuses on the qualitative method deployed in the section, a Grounded Theory method, concluding mentioning a dissemination narrative used by the author to deal with big set of data collected throughout her scholarship. The choice of this specific method has to be considered together with two factors. On one side, the limited duration of a PhD research in Denmark that covers three years, of which just one has been dedicated to this section. On the other, its consistency in regards to the methods favoured by scholars in contemporary research endeavours, that are mainly qualitative: case studies, grounded theory and ethnography (Cuff, 1991; Yaneva, 2009).

As mentioned, this paper frames some events that, in the recent economy of Denmark, have played a role in the definition of the modes of architectural production and its labour organization. The 1993 was a crucial year, after what in Denmark is known as the late-80s crisis: it was the year of both the entry into force of the flexicurity policies[vi] in the Danish Welfare State, with an undeniable success[vii], but also of the signature of the Maastricht Treaty, crucial for the international regulation of Europe aiming to the free circulation of goods, people, capital, service. These two events crucially defined the so-called Neo-Liberal turn and in Denmark created a shift in the labour market, towards asymmetrical conditions within the architectural practices.[viii]

In order to offer a close up on how the Grounded Theory method has been used in the research and to address the conference´ scope; this paper will skip an overview about the relevant facts occurred in the timespan here in subject that could be read elsewhere by the same author[ix].

Also, it´s important to mention here in the introduction, that, at the time of the publication, the method has been still ongoing. All the data have been collected and a preliminary side-analysis of data collection has started but the data decoding, and the following generation of the theory, are phases that will be developed after this publication and therefore are not part of it yet. So the reader can expect to read here about the method; to instead get an in-depth elaboration of the data collected and an understanding of how contemporary challenges have been faced by Danish architectural practices using several strategies and forms of resistance, the reader will have to wait a following paper, because this is not the subject here.

The structure of this contribution is divided into five sections: the Section 1 relate to "Grounded Theory (GT): Cases Identification" with sub-sections 1.1 about "Cases Screening and Selection" and 1.2 about "Recruiting respondents"; the Section 2 refer to the "Data Collection" with a sub-section 2.1 about the "Evolution of Initial

Questions: an example" ; the Section 3 relate to the "Ethical Guidelines"; the Section 4 conclude the paper commenting on the use of "Exhibition Design as dissemination narrative"

1. Grounded Theory (GT): Cases identification

In order to identify the cases to involve in the GT method the author identified some preliminary criteria of evaluation and case screening. The point of departure was related to a lack of information on the number of architectural enterprises specifically for the Danish environment. In Denmark in fact, since the profession of architecture is not protected, the number of the architectural companies is uncertain. Everyone could in fact register a new business under the industry code 71.11.00, and therefore also the registration to the different associations and unions that exist is on a voluntary basis. To give some numbers on the uncertainty of information, according to "Statistics in Denmark" there were 3,665 registered architectural firms (2015) and 3.518 (2008). However, according to the national register of the company (CVR) there were 2.432 registered architectural firms and these have 2,457 offices around Denmark (08/2017). When referring to European data instead, ACE recognizes that there are 1,422 practices (2016) and 727 practices only, in 2008. Considering instead the Danish Association of Architectural Firms they had 635 (2016) and 698 active members in 2010. Therefore, it was necessary to choose some sources from which the case screening could have started relating more on the content than on quantitative criteria. The research started then on 6 valuable sources that were divided in two kinds: research projects and cluster programs.

In regards to the first the author has considered academic and non-academic scholars that in the previous 10 years investigated Danish architecture with a particular focus on the practices, so a similar subject in relation to the author´s research, even though with different research questions and timespan.

First, in 2007-09 Tine Nørgaard and Anders Høyer Toft developed an academic research named "The architectural cluster in Aarhus: A study of the history of the cluster and current status" in which the argument was related to the identification of Aarhus as an economic cluster favourable for architectural companies. To do that they built a genealogy of the architectural businesses in Aarhus, dating back to the foundation of the Aarhus School of Architecture in 1965.

Second, in 2012 Kristoffer L. Weiss and Kjeld Vindum published the book "The New Wave in Danish Architecture" that could be seen as the manifesto of a gained awareness among Danish architects of their international success.

Third, in 2016 the catalogue for the Danish Pavilion at 16th La Biennale of Venice – Architecture edited by Boris B. Jensen and Kristoffer L. Weiss "The Art of Many – The right to space". The aim of this latter is to provide a state of the art of, at that time, contemporary architectural Danish practices focusing on the main tendencies and lines of works. The outcome is a choral presentation of a substantial number of projects collected through an open call to practisers and students of architecture who have worked in Denmark.

To conclude on this first type of source: while the first one addressed the local scale of Aarhus focusing on the organization of the labour within practices behind their built outcomes; the others focused on a national scale using the projects to highlight current topics in Danish discourse.

As mentioned before, the second type of sources are related instead, to cluster programs, so those programs who are aimed to support a particular group of companies that have some common features to be sustained and promoted. The common ground is usually based on geography, economic aid and networking.

First, the "Wild Card" program supported by the Danish Association of Architects that "puts the spotlight on the young architects and makes it easier to invite newly established companies to the smaller tasks and invited architectural competitions" (Akademisk Arkitektforening Wild Card Statement, 2018). The requirements to be admitted in the program are related to: the company should be VAT-registered; a maximum of 5 years of establishment of the firm; at least one graduated as architect under the EU regulations; at least one architect member of the Danish Association of Architects.

Second, "The Architectural Project" program that, even though it was stopped in the Spring 2018 after the completion of this research´s phase, was "a cluster organisation for companies, local authorities, and research and teaching institutions, that worked on creating growth and jobs in Danish architecture and construction." (TAP Statement, 2018). To be admitted in the program there was a subscription fee.

Third, the "Internship" program supported by the Aarhus School of Architecture for its students in connection with a number of practices that can host the students for a period of time recognized by the School. The program consists of 4 weeks in January when the students are in their third year of the Bachelor and one semester in their first year of the Master.

To conclude on this second type of sources: while the first and the third one are national program, the second one was only related to Aarhus; all of them provide information related to those Danish practices actively engaged in cluster.

The initial cases identification started then from 234 companies extracted from the 6 sources. The listing was supported by the use of a chart in which each companies was registered under: the date of establishment, the location of each office (at least one in Denmark) and a personal self-statement as presented on each company website. This recording scaled down the cases identification: 41 were in fact foreign practices that worked in Denmark while other 6 had insufficient materials to be recorded in the screening. Any occurred overlapping between

the sources instead, was registered just once, but the overlapping was noted as a relevant information. A total amount of 187 practices was finally identified.

1.1 Cases Screening and Selection

The cases screening started as an operative phase using the identification chart. Through this latter, a deep analysis of the self-statement text was made recognizing a strong relationship between the use of language and the procurement of work.[x] Each text was then copied and pasted into two plug-ins useful to analyse and to visualise the lexicon used by the company to describe their approach and to promote their service considering the frequency of the words used by them. The aims of this approach were: first, to get an understanding of each case and its relevance for the study; second, to identify in the screening a number of "families" that the author named "shapes" in which practices could be grouped according to similarities.
The *"shapes"* were generated through systematic comparison of the 187 cases inspecting the lexicon used comparing the self-statements written by each practices. So, in order to cluster the outlined diversity within the 187 companies the author introduced 10 labels for those *"shapes"*, meant to recognize and identify specific features in the modes of production of the companies.

Here a list of the shapes that were identified and introduced in the screening (alphabetical order). "*Activists Architects*" are the ones that work mainly on self-initiated actions in a specific setting being able to procure work and create a commission finding investors and potential clients. *"Consultancy-based"* are the ones that work mainly as advisors of the public sectors investigating the feasibility of specific development initiatives or writing the brief for future competitions. "*Generic Scandinavian*" are the ones that rely heavily on the export of services based on a cultural common-ground that relates to a specific geographical origin; able to brand their modes of productions in the wider international peak of Denmark. "*Kitchen Architects*" are mainly start-up founders that just need a light infrastructure (a laptop and a Wi-Fi mainly) to work so they are very flexible and adaptable in terms of workspace. "*Label Architects*" are highly specialized companies that work as outsourced for producing specific energetic or technological certifications (BIM, C2C, LEED, DGNB, …). "*Post-it Architects*" are the ones that consider themselves as facilitators, very focused on the process of development of the projects and to the empowerment of the involved parties. "*Research-based*" are the ones who split the companies in a branch that deals with construction, and therefore with the outcomes of architecture; and another branch in which through fund-raising they develop independent research. "*Sons of the Welfare State*" are the ones whose companies were funded in the blossoming years of Welfare Architecture (1945-75) and still today they are relying heavily on being heirs. "*Total Designers*" are the ones that design in a cross-scale approach from product design to urban planning. "*Turnkey Architects*" refers to those who enter in the last phase of a project from the technical phase to the hand-in of the keys to the client, so sometimes they are not initial authors of the concept and they tend to have a product-based approach to architecture.

The Cases selection was supported by the matching of specific shapes for each of the cases. It has to be said that each of the companies may be classified with one or more *"shapes"*; however, having recognized them is helpful to cluster a number of companies as representatives of each shape. From these clusters a number of 3 representatives have been selected for each "shapes" considering which ones were more relevant and accessible for the author´s research project. The criteria for the selection are related both to the evolution of some the actual practices in connection to their ancestors[xi] but also to the existence of unconventional modes of architectural production. Some of the practices have been considered having a direct tradition of fusion or taking over of practices founded in the "Golden Years" of Welfare Architecture or some others have an indirect connection being mentioned as "moral heir of the Welfare Architecture"[xii] by influential scholars such as Carsten Thau; some are multi-disciplinary teams who have been crucial in bottom-up social and urban transformation empowering citizen to participate in the process; some are practices who procure work investing in non-academic research; or promoting a cultural program using magazine, gallery and artistic approach; or designing architectural prototype; or self-initiating projects to raise public attention. The heterogeneity of the selected cases is reflected also in their business size: they range from having a clear organization chart and more than 50 employees to one employee only as director.

1.2 Recruiting respondents

An initial approach with the 30 potential respondents was made sending a first email by the author to the contact details provided in the companies´ website. For each practices it was relevant to contact different figures according to each specific cases (founders, directors or CEO). It´s important to mention a specificity of the Danish architectural environment, related to the fact that all the personal contacts of the employees, without difference of roles, are usually disclosed on the company website, and this allow an easier direct-contact with the relevant potential respondents. The introductory mail described the content of the research but also presented the outcomes of the first phase of the research, mentioning a high international visibility of the author´s research and the possibility of publication and exhibition of the results in order to gain the attention of the readers. It should be mention that the

author´s "credentials", as a researcher who also had a background as educator and architect was significant in getting access to some of the cases.
Out of the initial 30 practices, 15 expressed a positive interest in the project while the others didn´t answer to the call. Those who were interested received a more detailed presentation of the requested interview and method. First, the scope of the interview was clarified as the "qualitative support of a dissertation on contemporary Danish Practices and trends in architecture labour"[xiii]. Second, the structure of the interview was presented through 7 sections: 5 of them under the title of "Specific" related to the practice workflow (Presentation of the Practice; Organization of the Labour; Organization of the Strategies and Mechanisms of doing architecture; Organization of the Workspace) while 2 of them under the label of "Generic" about the framework and internationalization of architectural labour (Denmark and Abroad; Welfare State and EU Polices for Architecture). Third, a request to audio-record the interview and to document the visit with
the use of photographs of the workspace, shared by the respondents with accompanying credits; but also the production of a visualization of the current workspace by the interviewer. Fourth, an invitation to find a preferred date and time to meet in the office.

To this mail the author got the availability of 11 cases out of 15; their interest in the study and positive answers determined the number of interviews undertaken: in the end at least one representative for each "shape" was interviewed except for one of them for which two companies agreed to participate. In total 16 respondents were interviewed into 11 sessions. It´s relevant to mention that the association made by the interviewer between each "shapes" and the respondents has been undisclosed to the respondents in order not to influence them in their answers.

2. Data Collection

As agreed with the practices, the interviews were semi-structured, as an open-conversation, and followed the GT principles of elaborating on each interviews before proceeding to the next one. This means that from the first to the last interviews, the initial questions evolved and some of the interviews´ sections were swapped or revised; relying on the experience gained in conducting the previous ones. Having an interview scheme allowed for comparison between respondents, but also enabled the interviewer to be flexible to follow respondent interpretations and still be able to collect the needed information for the research. Each interview was prepared in advance backing the questions with data and anecdotes specifically chosen case by case. The interviews were scheduled in the practice workspace across 4 months, going from December 2017 until March 2018. The data collection used a toolkit composed of several tools (Fig.1). An interview scheme specifically adjusted as above-mentioned. A logbook, from which after each interviews the set of pages used by the respondents were extracted and catalogued; this allowed each respondents to sketch freely while answering to some of the questions without being influenced by the answers of their colleagues. An organization chart that the respondents were asked to fill in using some coloured dot stickers, while talking about the labour organization of the practice. Ten cards with double side tags: on one side the names of a specific "shape" and on the other the corresponding questions to help the respondents understanding the concept behind the given name. (Fig.2)

2.1 Evolution of Initial Questions: an example

After the agreed one-week refusal of the consent´s signature all the interviews have been processed and the transcript was made following two different style: the information given by the respondent were reported without any cut while the questions by the interviewer were summarized in order to speed up the process of transcript. The transcript started in February 2018 and proceed until March 2018. On side of the interviewing process, as GT prescribe, some notes and first analysis have been made in order both to start the writing process and to develop the interview scheme.

It could be useful to mention here, as example, an issue that resulted to be crucial in the elaboration of the argument and that also it could be considered a good case of shaping the 11 interviews one after the others. In particular, the set of questions prepared by the interviewer in the interview scheme were concerned on the reception of European Union legislation in the Danish procurement system: if and how was it influential for the workflow of the practice itself? In order to avoid any "political" statement but also to avoid a possible hindrance in answering, each respondent was asked to comment a quote by a Danish architect, Pedersen who mentioned[xiv] "EU plays a key role as a core institution that affects the framework of how architecture is produced. In our profession, knowledge and commitment are often watered down because of the cumbersome process of EU procurement rules. That doesn´t make you a victim, that´s just the way the rules work and force you to work". This quote was used to trigger some reactions and start building a conversation on the topic asking more direct questions to the respondents. However, all the first respondents comment the quote saying that it was undeniably true but, the dialogue that followed, helped the interviewer to realize what was instead the point in question. The first 4 respondents, while answering, showed a dissatisfaction on the local political system and also they questioned if the superimposition of international agreements on local dynamics have created or not new opportunities of

procurement. So the interview scheme was revised and rather than asking whether the fulfilment of the European prerequisites for procurement have interfered with the modes of production and procurement, that resulted undeniable, two were the new triggering aspects inserted. First, what was the role of the Danish Welfare State in regards to Europe when adopting the requirements in their local legislation of procurement; second, whether the investment done in acquiring new knowledge by the practice about international procurement were deserving. It´s important to mention that this qualitative research followed a previous research phase on another timespan 1945-75 as before mentioned in which instead the Welfare State had a central role for the building sector allowing the blossoming of many architectural practices, behaving as a client for them. The knowledge of the other timespan was helpful to interpret the data collected using the qualitative method.

3. Ethical Guidelines

It is necessary to expand on the ethical guidelines[xv] used during the interview. As mentioned, a complete documentation of the research scope together with a request to audio-recorded were sent before scheduling the dates. So, all the 11 cases, aware of the research project´s scope and context, agreed to be recorded in advance. However, immediately after the interview and before proceeding with any transcription, a formal declaration of consent to take part in the research was sent to the responsible respondent for each case. The decision to send the formal declaration after the interview was made because there was a need by the interviewer to formalize the procedure; there was also a need to establish a mutual trust between the respondent/s and the interviewer in a personal meeting before asking to fill in any forms that could have the opposite effect of distrust. Rather than defending the rights of the respondent, in fact, it could alarm and overwhelm the respondents creating unnecessary anxiety.

The consent to take part in research include three parts: a formalization of some of the things that were mentioned orally at the beginning of each interview; a confidentiality option to be agreed; some information on the future access of the data.

Regarding the first one, it includes: a declaration of voluntarily agreement to participate in the research study. A one-week period of refusal after the signature of the consent before the transcription will start, in which case the material would have been deleted. A confirmation that the purpose and nature of the study were explained in writing (through the emails mentioned before and the "Index Room" booklet (Fig.3) that was handed in during the interview to each respondent containing a teaser of the first phase of the research). A ratification that the respondent had the opportunity to ask questions about the study and that understood not to benefit directly from participating in this research. A validation of the audio-recording consent and of the transcription consent to the interviewer and an assistant.

About the confidentiality options: the first one was related to the disclosure of the identity of the respondents in any research results; while the second one, was related to the anonymity of the identity of the respondents and of the people mentioned and in case the possibility to publish disguised extracts in any research results.

About the safekeeping of the data: the original audio recordings will be retained in the interviewer´s office in a private and secured drawer until the exam board confirms the results of the researcher dissertation. In addition to that a transcript of the interview will be retained for two years from the date of the exam board.

Regarding the access, under the freedom of information legalisation the respondents are entitled to access the information they have provided at any time while it is in storage as specified above. The transcription will be always open for the respondents´ consultation under request to the researcher.

To conclude it should be mentioned that all the 11 cases signed the consent opting for the full disclosure of the data collected.

4. Exhibition Design as dissemination narrative

To conclude the paper, it´s worth to do a reference to the dissemination plan of the research. Two installations so far have been used by the author to deal with the dissemination of big set of data collected throughout her scholarship. The definition of big data in the field of computing, it refers to

"extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions. Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating and information privacy."[xvi]

A common denominator throughout the research has been the collection of a large amount of hands-on data on which basing the induction of theory. The use of exhibition design has been fundamental to visualize and grasp at once a large amount of data, but it results also successful to disseminate the research to a wider audience of non-expert of the field. The first installation named "Index Room" condensed the big data related to the archive review (Fig. 4). It followed a classification of each project published in Arkitekten Magazine across 1945-75. 41 volumes in total were collected by the author: 11 monthly and weekly editions and 19 bi-monthly ones. Afterwards, a scanning session was needed to digitalise all the information acquired: 82 hours after, almost 11 days, the materials were digital and transformed into searchable files. An analysis was conducted afterwards, related to the classification of

each project published to get an overview of the quantity of production of architecture in that time-span. Each project published in the 31 years of the magazine was classified into Excel sheets for a total of 3809 rows and 10 columns. For each one an index card has been produced with 10 information (Fig. 5): the year of publication; the name of the author; if any co-authors; the issues in which it was published (noting if weekly edition or monthly one); the project name; its location; eventual competition ranking; specific class of belonging; year of design when mentioned; the client. More than 4600 cards were indexed and exhibited into a physical archive for a total 15 kg of paper card hanged on a white lacquered ring steel (Fig. 6). This installation transformed an archive review method into a physical display. But, if "Index Room" was an occasion to disseminate the first phase of the research, "Red Tapes" was a second installation designed to disseminate the GT method presented in this paper (Fig. 7). The name refers to an idiom used to indicate the "excessive regulations and to those formal rules that are considered redundant and bureaucratic and, since asking for a rigid conformity, they risk to hinder and prevent action and decision-making"[xvii] It is an installation that works as a media to visualize GT as research method, it asked to the visitors to make a shift in the mind-set to see things in scale 1:10. It shows a synopsis of 11 shapes drawn on the ground that represent the different workspaces of the 11 respondents involved in the GT in a drawing of 8x4 m (Fig. 8). A miniature book (4,2x5,5x4 cm), that collects in 666 pages, 116.127 words printed in 5 pt and exchanged in the 1312 minutes of interviews that have been transcribed in 266 hours, almost 1,5 months (Fig. 9). This condensed book was laid on a miniature table in scale 1:10, stretched in its height, that represents the minimal work station of an architect even when located in complete different settings (Fig. 10).

The dissemination plan uses installations, but not exclusively. The installations in particular are not finalized to the development of an iterative research by design and therefore a project as outcome of the research but they are used as a supporting mean. Therefore, behind the decision to use this narrative, there is a strong belief that the interaction of theoretical arguments together with the design of an exhibition, and therefore the occupancy of a physical space along with a facilitate interaction with a broad audience, are powerful experimental fields when doing research in architecture (Fig. 11-12).

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i The elaboration of this argument derived from a literature review on the topic and particular acknowledgements should be made to the conversations with Pier Vittorio Aureli and Maria Giudici while Visiting at the Architectural Association School of Architecture; to the reading of the book "Building in Time" by M. Trachtenberg in which L.B. Alberti is identified as the key figure in the shift towards professionalism in architecture; to the "De Re Ædificatoria" in particular in the book VI and IX mentioning some of the contemporary topics that relate architect and money. Regarding the Danish context instead, the conversation with Thomas Bo Jensen and Troels Rugbjerg have been crucial to trace back a similar shift; as well the reading of "P.V. Jensen-Klint" by Thomas Bo Jensen and "Gottlieb Bindesbøll: Denmark´s first modern architect" by Peter Thule Kristensen crucial to understand the birth of professionalism in architecture in Denmark and its relationship towards craftsmanship.

ii Franch, Kubo, Miljački, Schafer, Office US Atlas (Zürich, 2015), 26.

iii in "Work" by Peggy Deamer in MONEY, PERSPECTA 47 The Yale Architectural Journal, (2014), 27-39.

iv the author refer to the fact that architecture is considered among the "liberal profession" but to be named like this and not be considered an hobby need to produce an income as autonomous work. Referring to Hannah Arendt talking of the beginning of liberal profession "said that since payment for their services was voluntary, the liberal professions must indeed have attained a remarkable perfection in the "art of making money (128, Arendt, The Human Condition, 1958). She referred to the Plato conception of the "art of making money". On the other side if architecture is not paid it should be intended as an hobby so as "every activity unconnected with labor" (128, Arendt, The Human Condition, 1958).

v Angela Gigliotti is PhD fellow at the Aarhus School of Architecture, Denmark (Fall 2017-Spring 2019; Supervisors: Walter Unterrainer and Charlotte Bundgaard) and Visiting PhD Candidate at the Architectural Association, School of Architecture London, UK (Spring 2018; Supervisors: Pier Vittorio Aureli and Maria Giudici). The nature of the work in architectural profession is a crucial point of departure that this research addresses. Scholars have extensively focused both a genealogy of the main exporters of modes of production and, also, those cases where the friction between labour and work has been more evident. However, the cases of the knowledge-importers instead, and Scandinavia as one of those, have rarely been discussed. In this latter an investigation of the profession in relation to the economic system has not been a priority of scholars yet, concerned instead on the works of the architects, as welfare outcomes. The research aims to occupy this niche: to investigate the relationship between the Danish Welfare State and the contemporary modes of architectural production to unveil which are the mechanisms that the architectural practices (*tegnestuer*) have deployed to face economic junctures. The thesis addresses two time-spans. The first one, after the WWII (1945-75) covers the Trente Glorieuse and the production of the architects blossomed under the Great Optimization. The second one concerns the recent Neo-Liberal turn (1993-2016) focusing on: the national policies aimed to a flexible labour market; the supranational agreements of the European Union related to the free circulation of service; and, the adjustments to public procurement below the EU threshold. In both time-spans, the call to efficiency and standardization and the consequent division of labour will be addressed. Using a mixed method, the research defines how global and local influencers have shaped the Danish architectural modes of production and which are the current mechanisms developed by the offices. The argument sustains that after the WWII, the influences on architectural profession were direct and boosted its blossoming intentionally ("hidden recipes"); while in Neo-Liberal times those have been indirect and perceived as brakes to the architectural profession ("red tapes").

vi In 1993 Denmark saw the introduction of `flexicurity´ policies in the labour market, which are based on the possibility of hire and fire in the labour market with total flexibility being sustained by a structure of security benefit for the workers. This delineated a crucial change in the labour market, and so, also in the architectural labour conditions. Generally speaking, the main difference was that the possibilities for employers to hire and fire, according to needs, were coupled with an active security system for employees: a relative shift "from a passive safety net in the unemployment to an active trampoline in the labour market". See more in Cox R. H., `From Safety Net To Trampoline: Labor Market Activation in the Netherlands and Denmark´ in Governance 11 (1998), 397-414

vii The "flexicurity" shift in policies had some positive effect and it could be translated in numbers with a fall in the unemployment in, the whole labour market (age 25-74) from the 12,4% to the 5% in 2001 (the lowest level since 1976) decreased to 2% in 2008 (b.Crisis). In 2008 in spite of the financial crisis, the Danish firms came out of 2007 with historically good results. In 2012 when the above mentioned crisis fully reached Denmark the unemployment touched the 6,5% (a.Crisis). See more in Statsbank - Statistic Denmark "Byg1: Number Of Persons Employed In The Construction Industry By Industry (Db07), Kind And Seasonal Adjustment" See the data: http://www.statbank.dk/statbank5a/default.asp?w=1920

viii The flexicurity brought a flexible labour market and a more neo-liberal direction, but despite other countries that witness the same turn, what has happened in the architectural practices in Denmark is unique. It has to be mentioned that in Denmark the working conditions of the wage-earners are regulated by collective bargaining between the representative bodies of both parts and this lead to the fact that almost the 80% of Danes are unionized. Also in the architectural practices, employers usually use a shared ladder to establish the salary of each employee. This means that there is not a negotiation on salaries, but what instead is negotiable are the fees paid to the architects for each commission and these get strongly affected by the neo-liberal turn, fully in line with the other countries. The asymmetrical situation therefore is that the architects as employees are highly guaranteed but the architects as employers are not.

ix in "The architectural practices and the Danish Welfare State: a changing open relationship" by Angela Gigliotti in "Emerging Architectures / The Changing Shape of Architectural Practices" edited by Walter Unterrainer, (2018), 74-81.

x The consideration of the relationship between language and capital has to be referred theoretically to a group of scholars in political theory who wrote extensively about it. Mainly see: Christian Marazzi (2008) and Paolo Virno (2004).

xi A first phase of the research was related to the timespan 1945-75 known as the Golden Years of Welfare State. During this phase the focus was on the production of the architectural practices in relation to the blossoming economy of the Welfare State. That phase was conducted using an archive review of the magazine Arkitekten.

xii Carsten Thau "Liberation, the Death of Utopia and the Big Community Machine" in Jensen B.B., Weiss L., (2014), 27-39. Boris Brorman Jensen, Kristoffer Lindhardt Weiss, `Art of many – The right to space´. (Copenhagen, 2016), 196-205

xiii From the first mail sent to 30 potential respondents by Angela Gigliotti on the 15th November 2017

xiv Johannes Pedersen (NORD Architects) in Jensen B.B., Weiss L., (2014), 27-39. Boris Brorman Jensen, Kristoffer Lindhardt Weiss, `Art of many – The right to space´. (Copenhagen, 2016), 486-493

xv It should be mentioned that the research environment that host the research, the Aarhus School of Architecture, has not an ethical committee or any requirements for approval of the guidelines in advance; so any initiative has been individually taken by the author studying on the literature similar scholar´ behaviour in respect with the ethical consideration mentioned in the PhD Plan and approved by the PhD Committee.

xvi From Wikipedia 2018: https://en.wikipedia.org/wiki/Big_data

xvii From Wikipedia 2018: https://en.wikipedia.org/wiki/Red_tape

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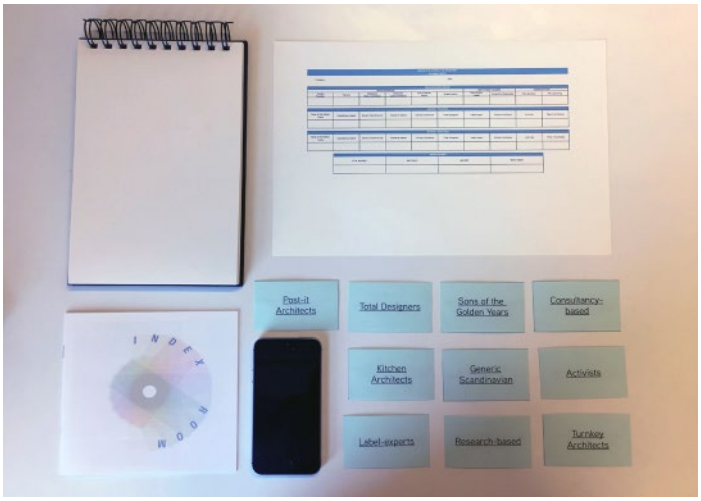
(All the figures otherwise mentioned are by OFFICE U67 ApS)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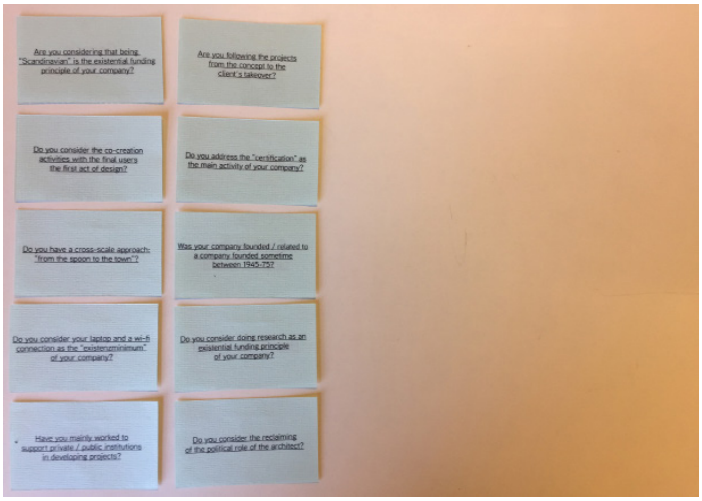
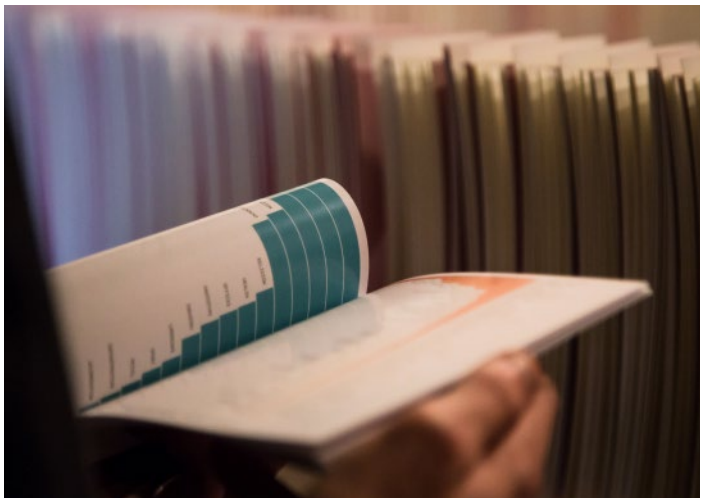
Total Designers
Sons of the Golden Years
Consultancy-based
Kitchen Architects
Generic Scandinavian
Activists
Label-experts
Research-based
Turnkey Architects


Are you considering that being "Scandinavian" is the existential funding principle of your company?
Are you following the projects from the concept to the client's takeover?
Do you consider the co-creation activities with the final users the final act of design?
Do you address the "certification" as the main activity of your company?
Do you have a cross-scale approach: "from the spoon to the town"?
Was your company founded / related to a company founded sometime between 1945-75?
Do you consider your laptop and a wi-fi connection as the "existenzminimum" of your company?
Do you consider doing research as an existential funding principle of your company?
Have you mainly worked to support privats / public institutions in developing projects?
Do you consider the reclaiming of the political role of the architect?

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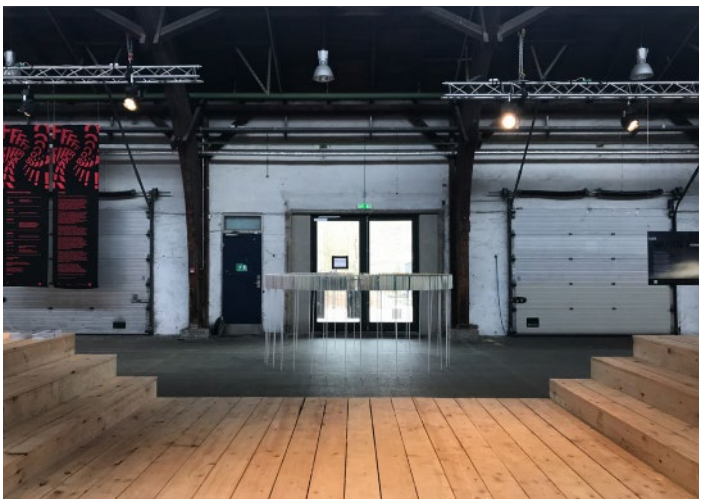

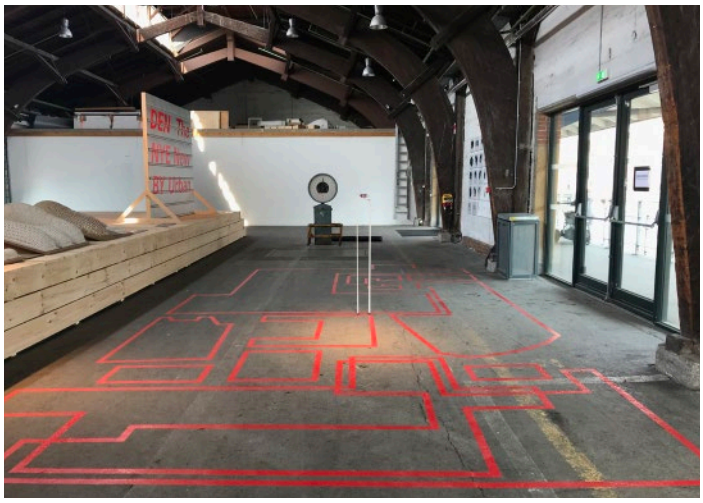

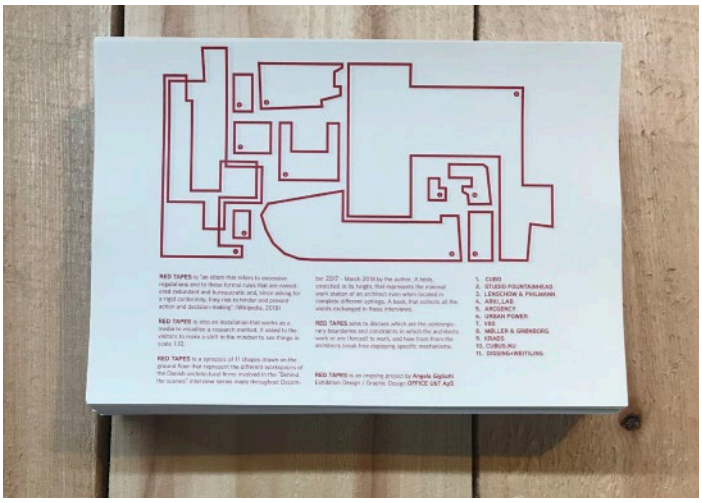
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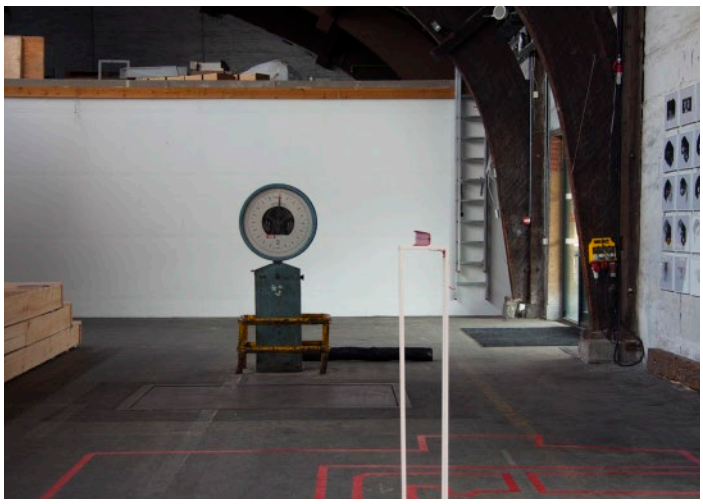
RED TAPES
1. CUBO
2. STUDIO FOUNTAINHEAD
3. LENGCHOK & PHILMANN
4. ABELLAS
5. ARCGENCY
6. URBAN POWER
7. V&S
8. MØLLER & GRØNBERG
9. KRADS
10. CUBUS.NU
11. DISSING+WEITLING

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FACETS OF FORENSIC DESIGN STRATEGY

MICHAEL WILDMANN

Facets of Forensic Design Strategy

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Abstract. With the aim of building an energy-efficient environment, the design and planning processes of buildings and cities become more and more complex. The current planning processes are even more multidisciplinary. If these are replaced by inter- and trans-disciplinary processes, new developments are taking place. In Forensic Design Strategy the effects of the various possible approaches of the individual planners are set as a function of one another in order to get the best overall solution and not the best single solution for each department.

Keywords. Forensic Design Strategy; Green Building design; environmental design; inter- and trans-disciplinary design process; energy

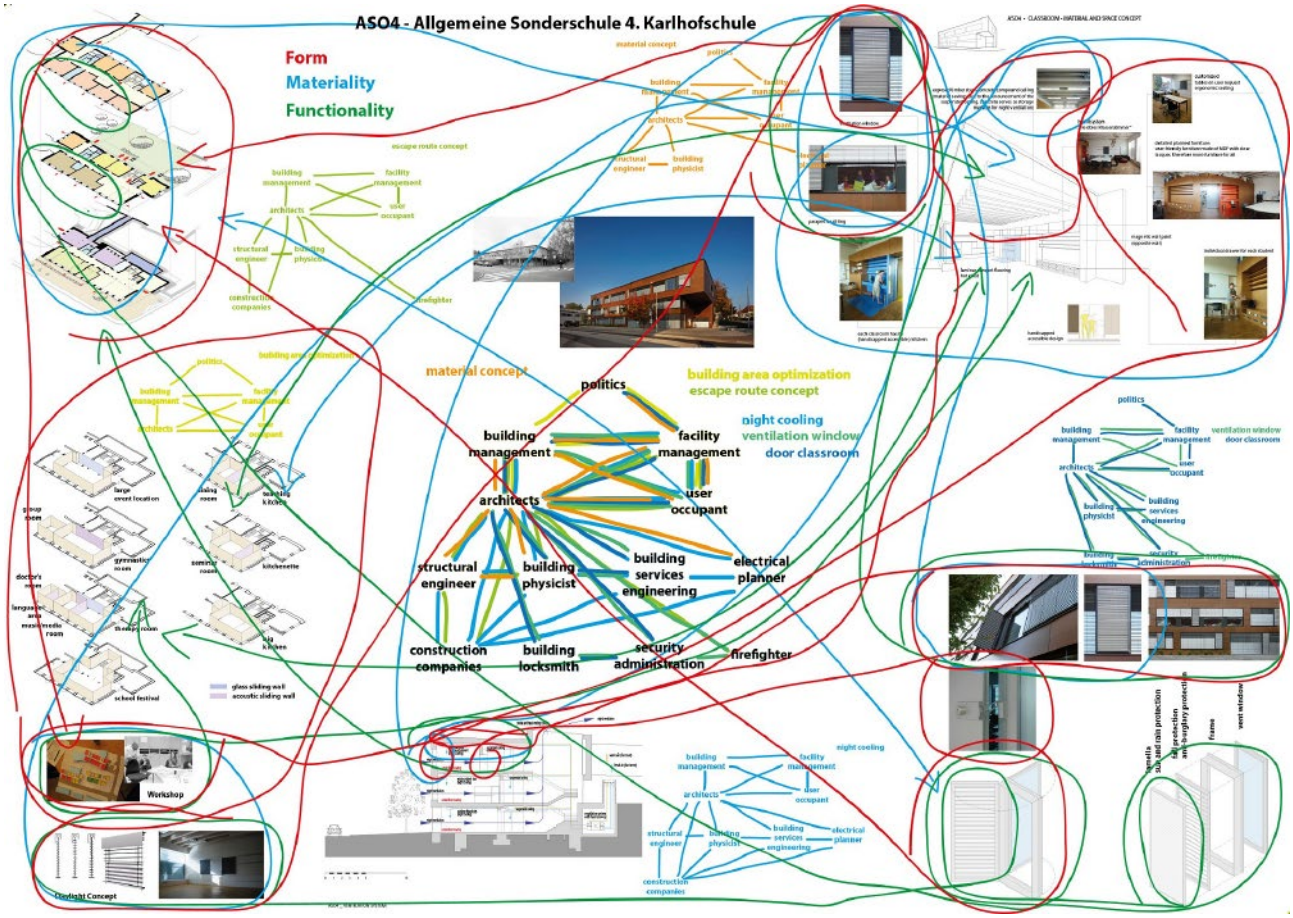
Within my research, which I am conducting as a PhD candidate and former ADAPT-r fellow at Sint-Lucas in Brussels, I am exploring an inter- and trans-disciplinary design process we (grundstein) call “Forensic Design Strategy” [Origin of forensic: Latin forēns (is) of, belonging to the forum, public (see forum, -ensis) + ic]. The term “forensic” is based on a form of political debate. "Forensics" is a word rooted in the Western worlds classical experience. The Greeks organized contests for speakers that developed and recognized the abilities their society felt central to democracy. These exercises acquired the title "forensics".

In our practice grundstein we are over and over confronted with the fact that the different technical experts propose solutions which only focus on their own fields. Often these solutions turn out to be counterproductive to solutions which have been suggested by experts of another field. By trying to solve these repeatedly emerging conflicts the whole design becomes more and more complex and expensive.

In examining our award-winning planning results, the way the individual involved participants collaborate stands out.

Common design practices come from analogous times. The planning processes are usually multidisciplinary [Max-Neef 2005] and the design process is based on knowledge acquired from experience.

In Forensic Design Strategy the effects of the various possible approaches of the individual planners are set as a function of one another in order to get the best overall solution and not the best single solution for each department. This design process in inter- and trans-disciplinary teams is process-oriented and has a common goal. Within these processes the traces of design decisions are inspired by various influences from different angles of different people from different disciplines. In the case of multidisciplinary decision-making processes, innovations are created only in the various specialist areas. Through inter- and trans-disciplinary working methods, all three types of knowledge (system knowledge, target knowledge and transformation knowledge) can be implemented in the development and design process. This increase in knowledge, the manifold inspirations of other disciplines, and the security provided by a coordinated approach by all relevant decision-makers lead to a development thrust for new solutions and developments through inter- and trans-disciplinary design and planning processes.



Visualization of the "Forensic Design Strategy" in the project ASO4

Most common definition of the single disciplines in the knowledg production comes from Manfred A. Max-Neef's "Foundations of Transdisciplinarity" based on Erich Jantsch's theories in "Inter- and Transdisciplinary University: A Systems Approach to Education and Innovation" [Max-Neef 2005] [Jantsch 1970]

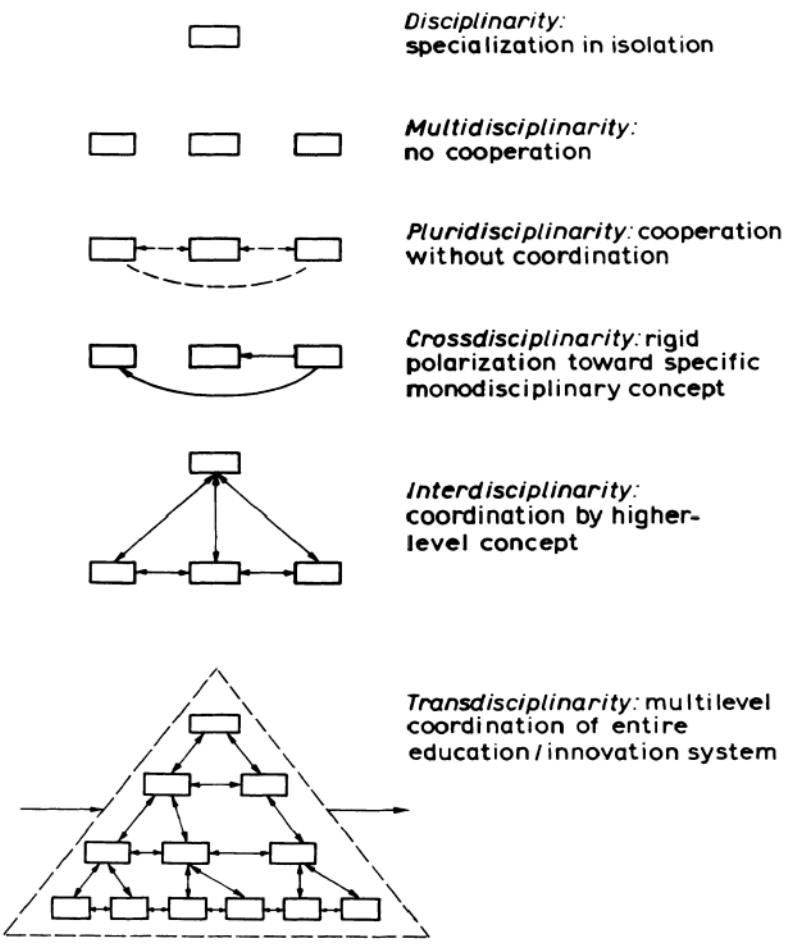


Figure 2. Steps toward increasing cooperation and coordination in the education/innovation system.

Figure from Erich Jantsch, Inter- and Transdisciplinary University: A Systems Approach to Education and Innovation, Policy Sciences [Jantsch 1970]

New technology enables new achievements in design production. These processes are accompanied by an increasing number of professional planners. It also requires new paths in the design production.
Individual planners can offer the best solutions for a job in their specific area of expertise. These solutions raise new problem areas in other areas, which in turn are solved by the responsible professional planners. This leads to a complicated, technically elaborate solution and is removed in small steps from the actual overarching goal (simply cost-effective to build ecologically). These new challenges with more sustainable requirements need new ways of knowledge production and decision-making. In inter- and trans-disciplinary teams one can find new solutions.

In order to meet this fast-growing and changing development, it is being resorted to more and more professional planners who keep their in-depth knowledge up to date. Today, there are a large number of different professional planners, and due to the tendency of further specialization, new sectoral planning areas are constantly being created.

Each planning task has a definition of a common goal that the planning team wants to achieve. The individual planning participants are specialists in their fields and also have the ability to find a solution in this field in the sense of the common goal. Their pronounced specialization only allows

them to roughly estimate the impact of their proposed (best) solutions on the other disciplines, and they are unaware of most of the implications.
The different approaches are also reflected in the different assessment of solutions. So most of the professionals involved in the design process are trained to find the right solutions while the designers are looking for the best solutions.

Rittel used the term "wicked problem" to describe the elusive problems of planning, comparing with relatively "tame" soluble problems in traditional science.
Horst Rittel and Melvin M. Webber describe "Wicked Problems" in there 1973 publication "Dilemmas in a General Theory of Planning" as problems that defied ready solution by the straightforward application of scientific rationality.
Rittel and Webber's 1973 formulation of wicked problems specified ten characteristics
1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule.
3. Solutions to wicked problems are not true-or-false, but good or bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial and error, every attempt counts significantly.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The social planner has no right to be wrong (i.e., planners are liable for the consequences of the actions they generate). [Rittel 1973]

The design processes in architecture are still dominated by very traditional work processes between the individual disciplines, one still finds work divisions characterized by exact interfaces and planning boundaries. The decision-making structures also follow these boundary lines. Only 20 years ago, the architect and the structural engineer did not involve other planners in the design phase for smaller and medium-sized construction projects. This has changed dramatically today due to the sharp increase in legal and technical requirements.
Liability issues are one of the reasons why these old traditional structures of interfaces and planning boundaries still hold. However, the knowledge divides itself on more and more involved parties whereby also the decision structures get more and therefore narrower limits. Another important reason is the education and the professional training.
Every design problem is a "wicked problem", while the technical experts' problems are usually "tame" problems. The nature of the problem affects the approach to problems. Since every single decision in a planning process usually has an influence on the design, it will always be necessary for the designer to make decisions in the team, whereby "tame" problems naturally do not require the decision in group to find a solution. The technical experts are accustomed to work independently in the given conditions to develop a solution in their exact areas of responsibility.
In order to achieve the best possible result for the goals set, it is necessary to widen the traditional exact boundaries of these areas of responsibility so that they become flexible and overlap with other

areas. This requires a definition of fixed and flexible parameters with their exact requirements, importance and dependency.
The fixed parameters are immutable presets where it is important to weight and define any margins. Mainly these parameters result from laws, standards and the requirements, goals and wishes of the clients. Many of these fixed parameters only concern individual participants.
In the case of the flexible parameters, the definition of the dependency between the individual persons involved in the solution of this aspect is particularly important, as it also gives the participants of the individual team groups. Flexible parameters may also have dependencies on other parameters, which may increase the circle of stakeholders involved.

After the definition of the task, solutions are worked out together. Whereby all participants are equal and actively involved.
The decision-making processes in the team are on an equal footing. Each member participates.

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MOVING ALONG THE TERMS OF TAXONOMIC LANDSCAPES

MARKINGS OF A MANIFOLD PRACTICE (DUCTUS, MODUS, SKOPOS): ON REPRESENTATION IN PRACTICE BASED RESEARCH

TOMAS OOMS

MOVING ALONG THE TERMS OF TAXONOMIC LANDSCAPES: MARKINGS OF A MANIFOLD PRACTICE (DUCTUS, MODUS, SKOPOS): ON REPRESENTATION IN PRACTICE BASED RESEARCH

PAPER OF AN EXHIBITION AT THE CA^{2}RE – RESEARCH CONFERENCE – AARHUS (DK)

drs. architect Tomas Ooms,
Studio Tuin en Wereld &
Faculty of Architecture KU Leuven
Campus Sint-Lucas

AN EXHIBITION

"To speak of my offices / I undertake to sort the essentials, / the diverse, simple things, / into an integrated work ... . /And there [within the framework, as just described] I arrange my ornaments / my flowers, my colours, my green lawns / in order to attain by hard labours / the goal encompassed in my intention [corage]."

This sentence could have been an expression of a researcher on his practice based research track. But it was expressed by Deduccion Loable. She is the eleventh lady of Rhetoric in the 14th century manuscript ' Les Douze dames de Réthorique ' . Nevertheless, it describes in a very sensitive way one of the basic mechanism of practice base research. The current paper is a report on the exhibition-installation-presentation at the CA2RE conference that showcased results from the ongoing Ph.D. research Yard and World: To Draw a Distinction: On the Form of Re-entry: A Practice: Between: Yard and World: ...

The research examines the manifold that constitutes the authors' practice. The manifold practice is composed out of four studios ' : The Faculty Studio (Faculty of Architecture KULeuven), the Office Studio (a&t architects), the Research Studio (Studio Tuin en Wereld) and the Composing Studio (Tomas Ooms).

The research investigates the manifold practice by examining its multiple output and by exploring how the results of this investigating feed back into the manifold. This form of re-entry performs an operation(s) and contributes to the production of new output. The research explores the mechanism of this 'operationality' of the form of re-entry.

In is important to mention here that the paper is rewritten to consider and integrate the feedback from the peer-review panel during the presentation at CA2RE Aarhus. As part of the practice based research track the protocol of submitting a full paper after the acceptance of an abstract is extended by allowing the researchers to revise the paper after the presentation at the conference. This process of peer-reviewing needs some attention hence it is mentioned here.

Image 01:
Model and photo of the Brouckère project – proposal for the reconversion of an iconic 1966 office tower in Brussel (BE) – detail from an exhibition in Brussel - December 2017 – example of output from the Office Studio.

THE MANIFOLD UNFOLDED

To situate the practice based research it is necessary to ' unfold ' the manifold and briefly describe what happens in the four practices that form the manifold. As you may have noticed the four practices are called ' Studio ' s ' : as in the room (space, atelier) in which (artistic)work and experimentation is done. These studios have a conceptual component (their main preoccupation) and a spatial component (the place of action).

The Faculty Studio concerns the design studio that forms the core of the curriculum of the faculty of architecture. The modus operandi of the Faculty Studio is Research by Design that revolves around

two lines of inquiry: The ‘ Urban Condition ’ on the one hand and ‘ Architecture as a Cognitive Craft ’ on the other. The former focusses amongst others on the relation between the private sphere and the public realm. Architecture as Cognitive Craft starts from the concern and premise that Research by Design and (the production of) architecture take place in and through the production of architectural artefacts of inquiry (drawings, models, sketches, diagrammatical reflections…). Knowing is in drawing.

The Office Studio is a work- and project space imbedded in a large architectural firm in Belgium. My position here is to coach and mentor part of the design activities. Through my academic and research profile, this takes on a form not unlike that of the design studio teacher at the faculty. Project wise the Office Studio predominantly is involved with social public projects organised by public clients such as schools, social housing and elderly care. Occasionally larger private real estate development projects pass through the Office Studio.

The Research Studio is the conceptual framework through which the reflection on the manifold is operated. The Research Studio is the perspective from which this paper is written. The spatial component is a studio in the historical centre of Antwerp where a micro (public) gallery, ‘ Studio Tuin en Wereld ’ (Studio Yard and World) is installed to communicate on the outcome of the research in the manifold practice and to experiment with the forms of representation of the research output.

The Composing Studio somehow is the most unexpected of the four practices. It was never a goal or intention to become a full practice but evolved as such. Currently the Composing Practice is under scrutiny to discover if it is relevant for the ongoing research. The result of this will probably become the subject of another paper reflection.

It speaks for itself that not everything what happens within these four practices is relevant or pertinent in the context of the Ph.D. research. Therefor a research mechanism (protocol?) has been set in motion.

PRECEDENT: LAWS OF FORM

This research mechanism is formed by an entanglement between the theme (Topic, Focus, Interest, Line of Inquiry…) and the way work as research is done (projects, generative metaphors, representation). In this sense both ‘ what ’ and ‘ how ’ form a bicameral entanglement that builds on two quotes by George Spencer-Brown that *'a universe comes into being when a space is severed or taken apart'* and on the act of *'drawing a distinction'*. To draw distinctions becomes the central activity in the manifold practice. Drawing a distinction is both an operation in space (you create something while naming it) and an operation in time (there is a before and after). Drawing distinctions is a recursive expression that becomes the core of the research mechanism.

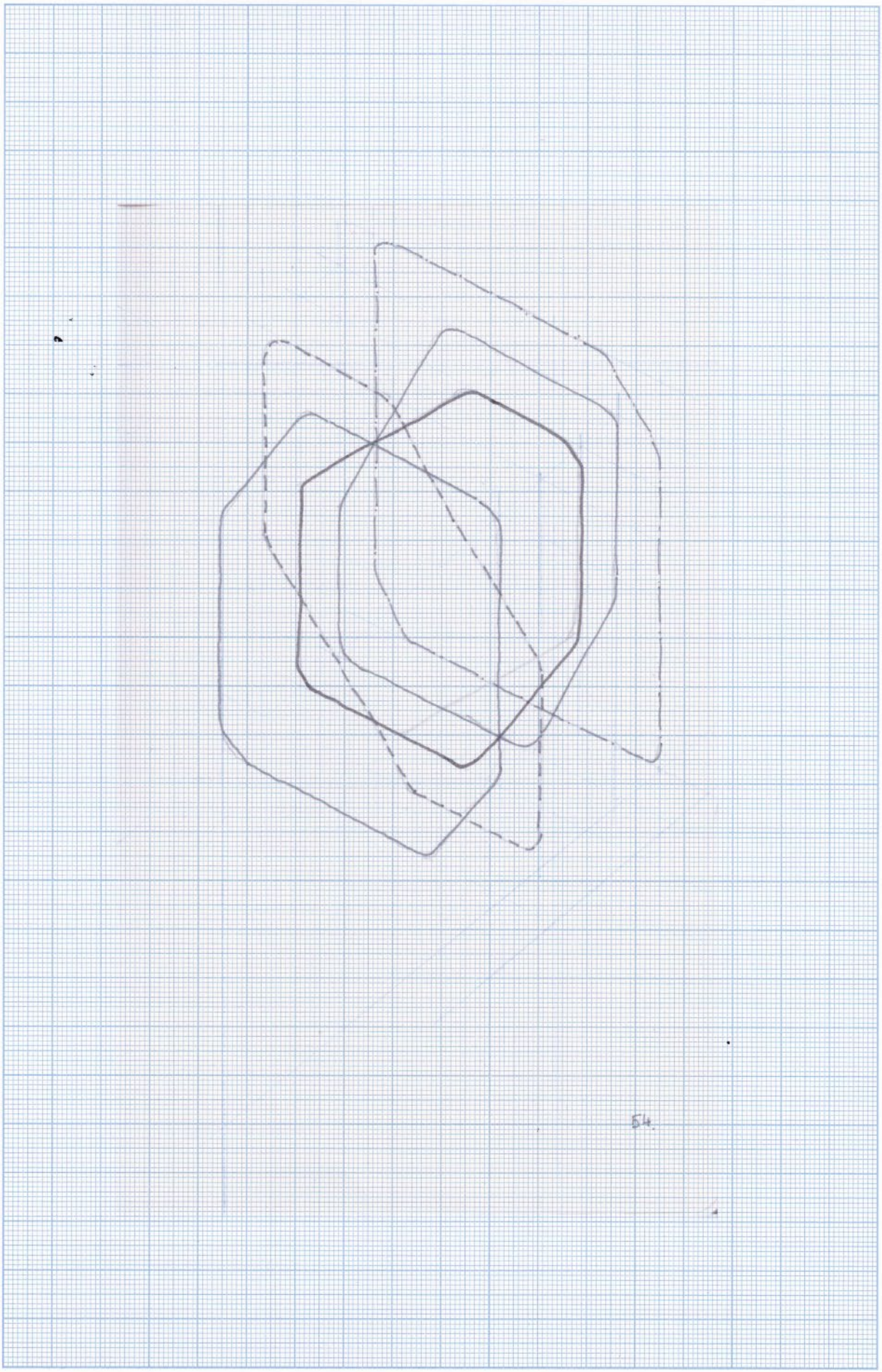
The form of re-entry becomes a paramount and crucial driver of the research of and in the manifold practice. Both theme and work as research emerged out of the manifold.

Image 02:
Representation of the manifold practice, graph paper sketch - the sketch represents the space formed by the manifold practice in combination with the representation of itself – example of output from the Research Studio - 2017.

RESEARCH MECHANISM: THE FORM OF RE-ENTRY

The research mechanism thus is constructed out the following components: Theme (Frame) + Projects + Generative Metaphors + Representation.

The Theme (Frame) is a driving filter or sieve to look at the outputs of the different practices and acts as a mould (model/template) for new kinds of output and insights. The theme is what is named ‘ Yard and World ’ and deals with ‘ Distinction ’, ‘ Overlap ’ and the ‘ Interval ’. It is not in the scope of this paper to describe this in depth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nevertheless it will be touched upon later in this paper.

The Projects (the design studio assignments, the office studio projects, the micro gallery exhibitions, the published papers &c) are a source of data to study and because of the feedback mechanism of the form of re-entry, they are influenced and impacted on, affected.

The Generative Metaphors act as disturbing input brining to the front and actualising untapped qualities in doing so this generates traces, not unlike the pictures of particle collisions. The concept of the Generative Metaphors is a variation on the manner in which Donald.A.Schön ' s uses it in his seminal work The Reflective Practitioner. (Also, this is beyond the scope of this paper.)

What is in the scope of the paper and was the focus of the exhibition-presentation at the CA2RE conference is the form of representation.

The manifold practice and the research itself are continuously presented and re-presented in different ways to (a) further the understanding of the manifold practice and of the mechanism that drives the manifold and (b) to yield a new comprehension of the theme (Frame). The last three can be considered together as the way in which work as research is done.

The research mechanism is driven through (a) the production and harvesting of architectural artefacts of inquiry (drawings, models, sketches, texts, music, objects...), (b) the designing of learning, (c) the curating, staging and representation of the different outputs (like the current exhibition), (d) the introduction of generative metaphors and (e) a reflection on the above that is fed back onto the manifold as a form of re-entry.

Image 03:
Graph Paper Drawings - representing the Ph.D. research from two different perspectives - both show a time-based representation of the track of the Ph.D. – diptych – example of output form the Research Studio - 2017

REPRESENTATION AS FORM

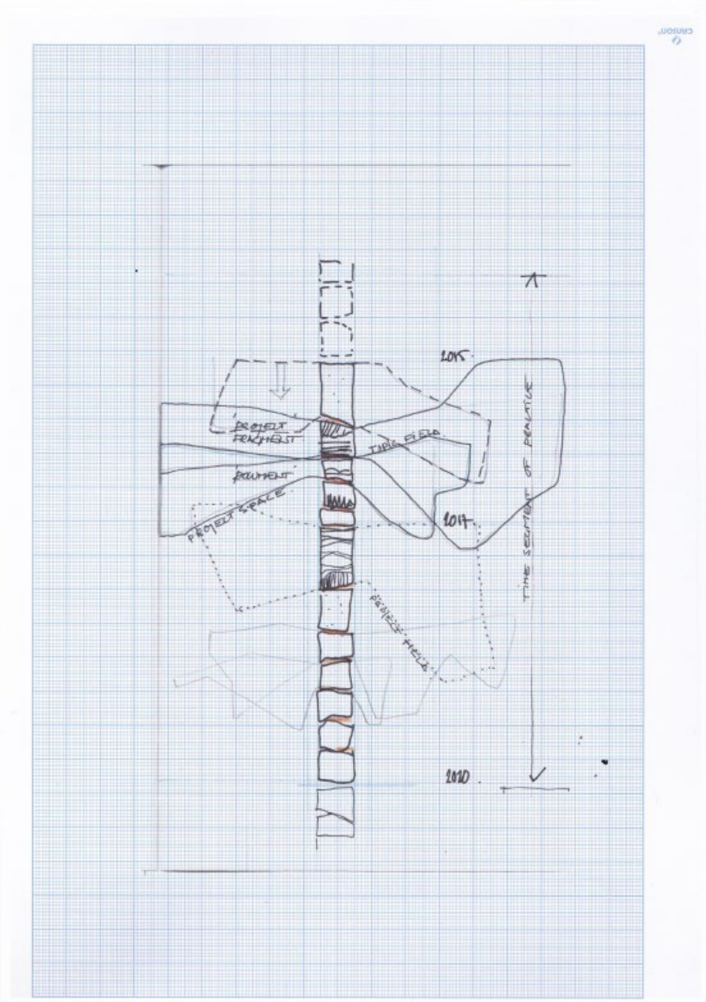
This aspect of representation as form of research was the focus of the exhibition-installation-presentation at the CA2RE Aarhus. It was the opportunity to specifically reflect and highlight this aspect of the present Ph.D. research.

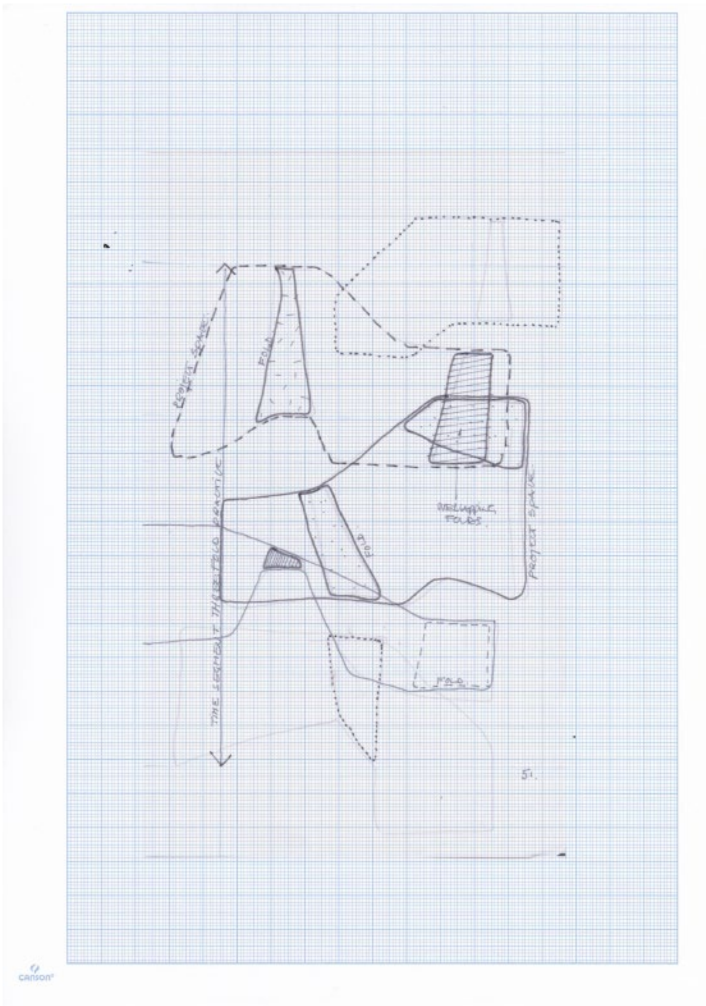
Within the space of the manifold and hence of the Ph.D. representation is understood the way David Ross Scheer ' s use of the term in ' The Death of Drawing '. Scheer states that ' representation conditions our understanding of the world, setting its term and limits. ⋯ Exposing how a representation somehow omits, conceals or disfigures some aspect of our experience; asking a question about reality left unanswered by our representations of it; finding a new way of representing something that yields a new understanding of it – these are the kinds of strategies employed⋯ '

And although David Ross Scheer is stating this in the context of design, I suggest this equally applies to practice based research. In the context of the present practice based research, representation is used to give an account of, the organise the material (data), to generate understandings of influences, of uncovered and undisclosed re-entries and entanglements between practices, between projects, to show prequels and prerequisites, to visualise and create research itineraries and research maps. Representation is used to show how research is done, if and where operationality has been observed. Representation then becomes a way of harvesting knowledge. Knowing is in drawing.

Also, David Ross Scheer mentions that ' ⋯thanks to the inherent ambiguities of representation, every utterance is an opportunity to question representation, to highlight and explore its ambiguities and to invoke other possible ways of representing the same or similar ideas. '

This is a crucial observation both within the frame of the design process as within the practice based research because: ' The ideas themselves change with their representations, so that there is a constant,


2015.
PROJECT FRAGMENT
TOPIC FIELD
DOCUMENT
PROJECT SPACE
2017.
TIME SEGMENT OF PRACTICE
2010.


PROJECT SPACE
FOLD
OVERLAPPING FOLDS.
FOLD
PROJECT SPACE
FOLD
5.

gradual (note from the author: not sur I agree with this part) transformation of our thinking as we become aware of and question our representations ' . And this is a crucial driver in the manifold practice and by extension to any kind of practice based research.

FROMS OF REPRESENTATION

Within the context of the present practice based research there are at least three distinct kind of representation developed and explored: the model, the drawing on graph paper and the Taxonomic Landscapes.

The models are architectural models that try to capture and represent a spatial expression of the research topics and findings. Due to issues of transport no models were present at CA2RE Aarhus.

Image 04:
Le Jardin, du Paradis as hypercube: Markings of a manifold practice: detail – Brussel - December 2016 – example of a model as output from the Research Studio.

The graph paper drawings are produced to further the understanding of the practice based research. They explore different ways to represent the possibility landscape formed by the manifold practice. Some of the graph paper drawings reflect on time, others attempt to grasp the evolution of the generative metaphors within the manifold. In a sense, they all represent the same thing, namely the practice base research of the manifold, in an albeit cubistic way: the subject remains but the perspective is shifted. Several these graph paper drawing were presented at the CA2RE Aarhus (see below).

Image 05:
Of Fragments: Taxonomic Landscape Created at the CA2RE Gent – detail - Gent, April 2017.

A third form of representations that emerged in the present practice based research are the Taxonomic Landscapes. Taxonomic Landscapes are composed out of fragments taken from the manifold practice and organises them in the ' enclosed ' space of a table top. Brought together, they aim to create a further understanding of the manifold practice. Taxonomic Landscapes are time-documents and samples of the current manifold practice. The goal of the Taxonomic Landscapes is to generate a focus on the possible interrelationships between the outcomes of the different practices. This way forms of entanglement, forms of operationality and forms of influence can be recognised, named and contextualised (framed). Each presentation moment in the track of the present Ph.D. is accompanied by a Taxonomic Landscape which is documented. The collection of these Taxonomic Landscape forms a series and hence one of the backbones of the Ph.D.

All three forms of representation thus have an agency of/as knowledge generating.

THEME (FRAME): DISTINCTION, OVERLAP, INTERVAL

As mentioned above, the Theme is a filter or sieve from which to look at the outcomes of the manifold practice. The manifold practice addresses a concept(ion) of space that is based on the ideas of 'Distinction', 'Overlap' and the 'Interval'. The manifold practice explores our contemporary way of organising 'Distinctions' and on spatially deliberating the relationships between them.

The activities (production of output) within the manifold practice are a continuous negotiating of wall and space, of distinction and overlap, of concepts of the enclosure, of the form of practice based research and on the form of re-entry, literally and figuratively. This is the foundation and driver of the practices of the manifold and is named ' Yard and World ' . It represents this double ambiguous situation of being ' Distinct ' but with ' Overlap ' . Of being a ' yard ' ' Distinct ' from the ' world ' but overlooking the ' world ' and being part of the ' world ' , a ' world ' composed out of ' yards ' . This describes a specific kind of relation. It is the

architectural expression of that type of relation that is explored and is developed in the manifold practice. The line of inquiry within the present Ph.D. is one of continuously exploring architectural interventions that showcase and reflect on this concept of ' Distinction ' and ' Overlap '. It is the ambition of the manifold to create spaces that are grounded and at the same time boundless. Spaces that are ' Distinct ' but have an ' Overlap '. Between Yard and World, between the Public Realm and the Private Sphere, between U and I, and defined by the ' Interval ' …

IMPROV(IS)ING THE TAXONIMIC LANDSCAPE AT THE CA2RE AARHUS:

The present exhibition installation at the CA2RE conference is the second presentation of the research within the series of CA2RE conferences (The first took place in April 2017 in Gent). The current contribution aimed at addressing some of the suggestions and questions raised at the April 2017 CA2RE conference. These concerned mainly the 'dialectics' of the exhibition 'an sich' and finding a way to disclose how knowledge is generated (answering the question How to inquire?). The sequence of presenting at the CA2RE conferences constitutes in this manner a reflective event to further the research.

The focus of the exhibition consisted of a series of drawings and prints on 'Steinbach' in different sizes (from A8 to A0+), different media, some of them on graph paper (Modus). The set is a representation of the research mechanism and contains fragments from the manifold practice (Skopos). It works as a set that conducts (Ductus) the audience through the works. The works were presented on different tables and formed a Taxonomic Landscape.
Due to some organisational issues, there was very little time to create the Taxonomic Landscape embedded in situ. In normal circumstances, there is an interaction and reciprocity between the works that form the Taxonomic Landscapes and the space in which the Taxonomic Landscapes are set up (created). On this occasion, this was not possible.

The original idea was to create a vertical Taxonomic Landscape. Due to the absence of wall space in the venue the works had to be presented horizontal.

Image 06:
Study sketch for the exhibition set up at CA2RE Aarhus – intention of creating a vertical Taxonomic Landscape - 2018.

COMPONENTS OF THE TAXONOMIC LANDSCAPE AT CA2RE AARHUS:

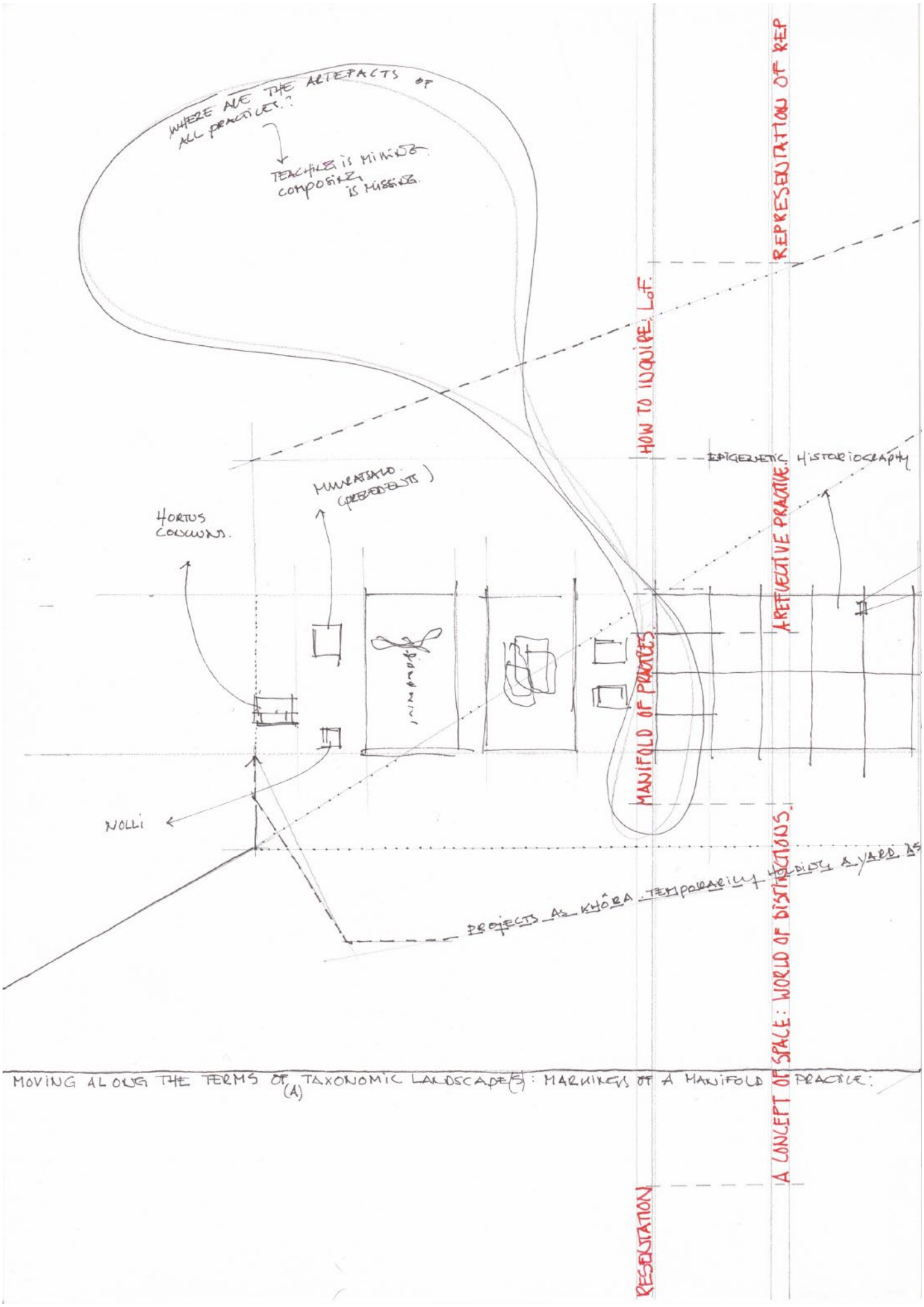
3 foldable rectangular tables, 3 low square podium elements, 1 round cocktail table, 23 fragments (drawings, prints, a tablet, a leporello booklet), 8 human figures scale 1:50.

Image 07:
Actual Taxonomic Landscape created at CA2RE Aarhus – overview

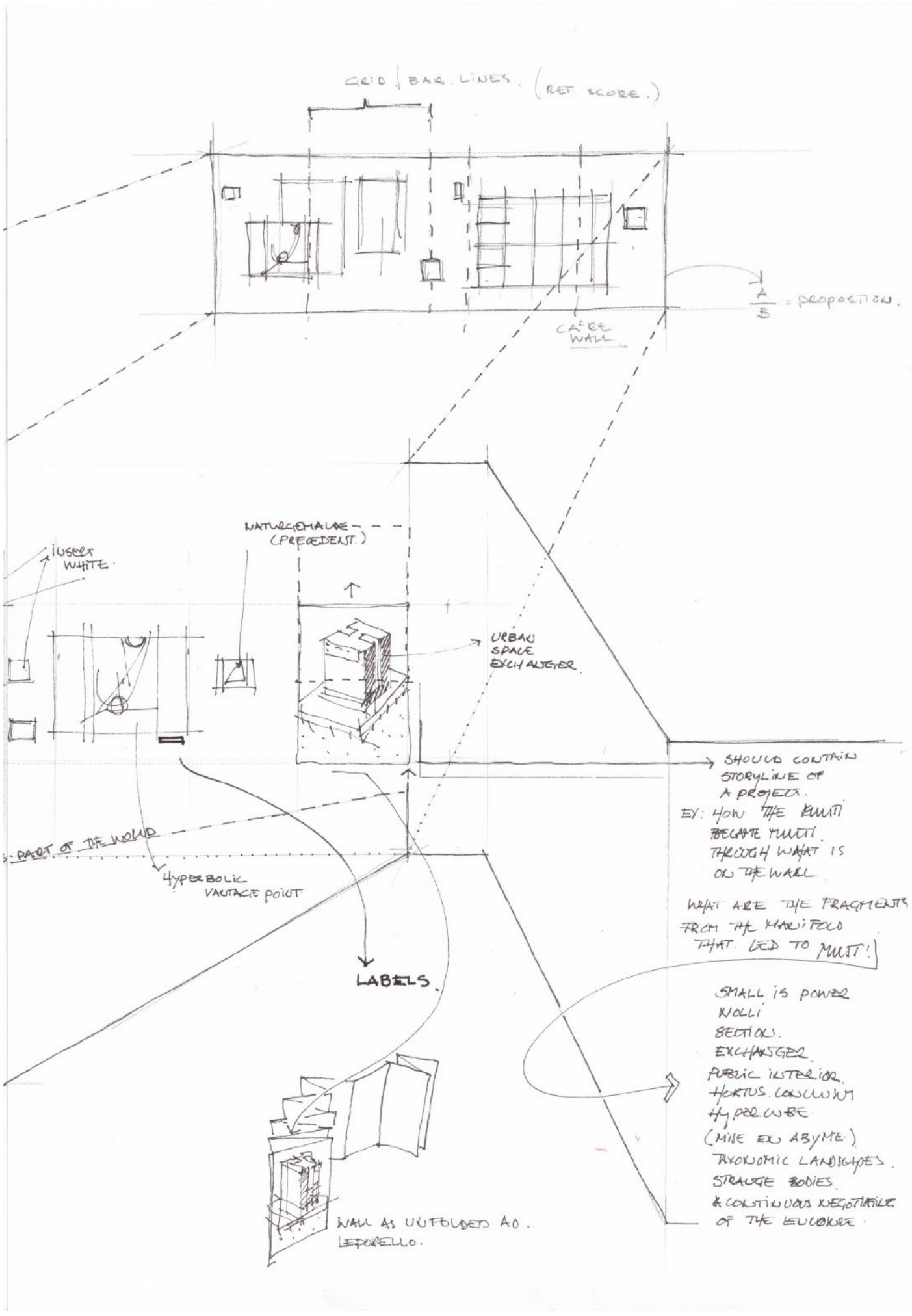
POST MORTEM: OBSERVATIONS AND IMPROVEMENTS FOR FURTHER DEVELOPMENT

Within the track of the present research participating at these peer-review conferences is considered as a means and as platform to further the Ph.D. Hence it is logic to conclude this paper by proposing improvements and insights that address the issues raised during and after the panel feedback:

- The interweaving of the different practices needs addressing. In comparison with the Taxonomic Landscape that was produces at the CA2RE Gent, the projects from practice where under-represented. The whole presentation was perceived as abstract and distant from the manifold.
- The issue of transporting the models needs considering. As follows from the previous observation the presence of more fragments from the practices is required to generate the interrelationships that are the base of the Ph.D.
- I would also like to propose a recommendation to the organisers of



MOVING ALONG THE TERMS OF TAXONOMIC LANDSCAPE(S): MARKINGS OF A MANIFOLD PRACTICE:
(A)


GRID / BAR LINES (REF SCORE.)
A/B = PROPORTION.
CA²RE WALL
NATURE/IMAGINE (PRECEDENT.)
USERT WHITE.
URBAN SPACE EXCHANGER.
SHOULD CONTAIN STORYLINE OF A PROJECT.
EX: HOW THE MULTI BECAME MULTI. THROUGH WHAT IS ON THE WALL.
WHAT ARE THE FRAGMENTS FROM THE MANIFOLD THAT LED TO MULTI!
PART OF THE WORLD
HYPERBOLIC VANTAGE POINT
LABELS.
SMALL IS POWER
WOLLI
SECTION.
EXCHANGER
PUBLIC INTERIOR.
HORTUS CONCLUSUS
HYPERCUBE
(MISE EN ABYME.)
TAXONOMIC LANDSCAPES.
STRANGE BODIES.
& CONTINUOUS NEGOTIABLE OF THE ENCLOSURE.
WALL AS UNFOLDED A0.
LEPORELLO.

similar peer-review events: if formats of presenting with physical artefacts (models, drawing, what not) are stimulated then some communication and supporting logistics need to be set in place.

- At the core of the present practice based research is a rich layering of topics, ways of representation, insights, outcomes &c… The pertinent and perpetual concern should be to explore and experiment with the mode of presenting, the way in which the account of the research is given. As mentioned by the members of the review panel: there is a conviction that the material is there but that the main preoccupation and point of improvement is in the guiding the audience to a form of concluding agreement on what is observed and experienced.

EPILOGUE:

After having spoken of my offices and undertook to sort the essentials into an integrated work to attain by hard labours the goal encompassed in my intentions, I look out from my yard into the world and remember reading in Paul De Wispelaere ' s book ' Between the Garden and the World ' :

" " *This house is his shell and his lookout, it is between yesterday and tomorrow, between birth and rebirth, between yard and world, between a moment and time, between myth and profane history, between the silence, the screaming and the bleating that echoes over the world."*

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DRAWING PROCESSES TO GENERATE ALTERNATIVE TYPOLOGIES AND ADDED VALUE FOR FRAGILE TOPOGRAPHIES:

A NARRATIVE ON CRITICALLY QUESTIONING INDICATED TERMINOLOGIES

LOUISE DE BRABANDER, THIERRY LAGRANGE AND
JOHAN VAN DEN BERGHE

Drawing processes to generate alternative typologies and added value for fragile topographies: *A narrative on critically questioning indicated terminologies*

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Abstract
Architectural practice seems to be under a moratorium on building in fragile topographies and hesitating to critically question this moratorium by formulating a strong cultural argument. It is often expected that these topographies—natural landscapes, urban areas or cultural heritage—are left untouched. In the Master dissertation project, *The Remembered, The Experienced, The Imagined*, located in one of the few remaining dune areas alongside the Belgian Coastline, the aforementioned moratorium has been investigated and critically questioned. Contrary to the predominant existing typologies at the Belgian coastline—the formations of high rise apartment buildings—a refuge was designed (speculative architectural design) that is not in contradiction with the reasons why people come to the seaside. Walking, writing and especially analogue drawing were the main and base research actions in this research case. They are further developed and refined in the current research. A film was produced and published (De Brabander, Lagrange en Van Den Berghe, 2017) as a self-reflection on this previous research and an unlocker of upcoming research steps. The current research aims to investigate—through the selection of additional cases—the possibilities and potential of architectural interventions in fragile topographies and to do so by drawing speculative design propositions that question existing typologies that our habitual ways of seeing and our collective memories seem to qualify as normative. Without wanting to annihilate other (digital) drawing techniques, a sequential application of these analogue techniques further develops innovative types of architectural drawing, e.g. *Critical Sequential Drawing* (CSD) (Van Den Berghe, Sanders en Luyten, 2018).

Keywords: fragile topographies, drawing, speculative design propositions.

Mode of operation

In this paper, first, the framework of thoughts that was established in the Master dissertation project *The Remembered, The Experienced, The Imagined* (De Brabander, Lagrange en Van Den Berghe, 2017), which forms the foundation of what is the subject of investigation in the current doctoral research, will be discussed. In addition to the written content of this paper, the viewing (for one who is reading this paper) of a short film involving the previous research is indispensible.[1] Subsequently, this film will be shown at the conference. The film was produced (as part of a self-reflection over the previous research that was done), published (De Brabander, Lagrange en Van Den Berghe, 2017) and displayed as part of an exhibition that took place in November 2017 at the Flemish Architecture Institute in Antwerp. Secondly, two questions that may occur in one's mind while reading the origin of this research will be addressed and answered. These two questions are: Why analogue drawing? and What is a fragile topography?

[1] https://vimeo.com/249421781

Research origin

One day, I went to the seaside, to a place where people can hide from their own lives and where I had passed by countless times but never stopped over before. Considering now, I was (and still am) the revenant, returning there every now and then. On that dreary day, and all the other days I went back, this place made me think of my careless childhood of which a fair part took place by the seaside—my grandparents lived by the sea for a significant part of their lives.[2] The memories I have from that time were the main mode of operation in this Master dissertation project and are still vital in the current research. The site is one of the sole left dune areas, located alongside the Belgian coastline. Several possible cases in coastal areas were explored before eventually finding this site. Most of these dune landscapes are small and densely surrounded by high-rise apartment buildings. Hence it seemed like a self-evident decision to start looking for another site, by the seaside but in a way somewhat less affected by human presence. The exploration of the site happened through several walks, journeys, on which a strong focus was put on the outspoken haptics and tactilities that are inherently present there, historical artefacts (e.g. ruins) and existing architectural typologies. Ideas cultivated from the first perception of the site, meditations upon initial thoughts or a reconsideration of the existing topography would later become the framework for invention (Holl, 1989) and intervention. The visualization of my findings on these explorative walks (journeys) happened through the making of topographic maps and prospective images (Fig. 1). Prospective because they are part of an exploratory, preliminary process, images because they are not merely photographs, they are converted and an intensive process of *making* lies beneath the visible surface of the paper.

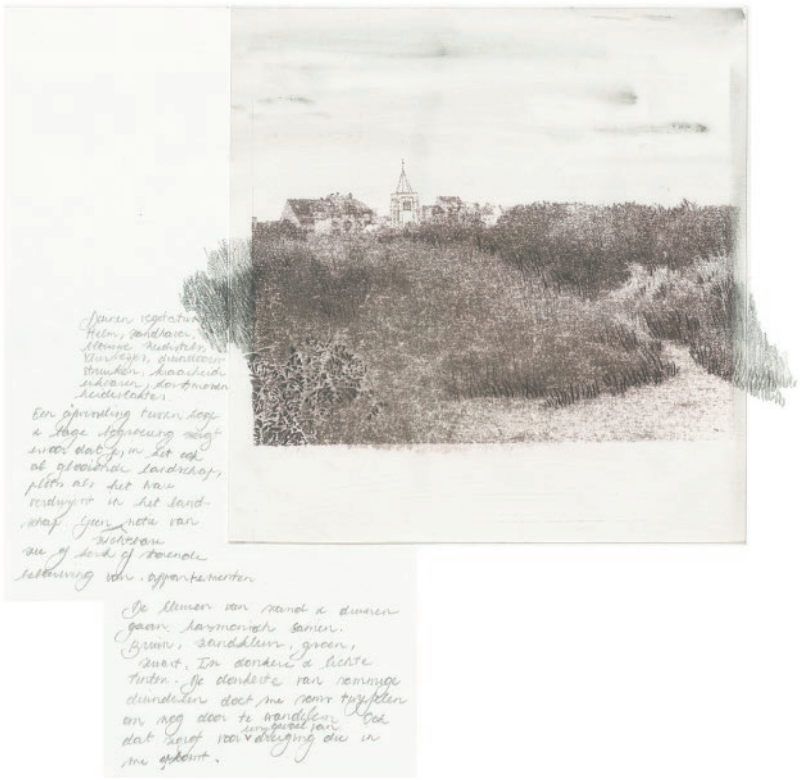

Figure 1: Example of a prospective image.

After years of replacing dune landscapes and valuable houses[3] by high-rise apartment buildings—something we can call liberal pragmatism according to Marc Dubois (Dubois, 2015)—leftover areas are preserved because governments impose it. Nowadays, it is expected that architects leave these topographies untouched. It seems that architectural practice is under a self-imposed moratorium, avoiding to build in these topographies and hesitating to critically question this moratorium. Currently, there is a global institutionalization (Otero-Pailos, 2016), democratization and commercialization (Frank, 2015) of

[2] Sometimes the style of writing will shift to a more poetic phrasing because I find it necessary for the reader to be immersed in my personal stream of thoughts from time to time. This happens in close consultation with my co-authors.

[3] Elegant sea cottages, often built before the war, with views on the water from under covered terraces in front of the houses, so people could enjoy the views and clean fresh air while being protected from the sun.

heritage, and of fragile topographies in general. However, more recent insights contend that tangible objects, like architecture or certain landscapes become 'heritage' only when collective memories, meanings and values are attributed to them (Lähdesmäki, 2016).

Picking in on what is stated in the very beginning of this paper, in this first research case (which is to be seen in the film)—*The Remembered, The Experienced, The Imagined* (De Brabander, Lagrange en Van Den Berghe, 2017)—located in one of the few remaining dune areas alongside the Belgian coastline—eventually, a refuge was designed that questions the aforementioned moratorium. The design was elicited by the extensive explorations of the site that happened through various site visits. It evolved from ephemerally designed fragments (volatile and shallow in the sense that in that early stage, not enough knowledge involving the site and knowledge through literature was gained yet) to a deliberated, embedded whole wherein materials that interlock with the perceiver's senses provide the detail that moves us beyond the mere visible to tactility and hapticity (Holl, 1989), extending the momentary experience of coming there. Most often, coming to the seaside is a momentary experience. One wants to prolong that experience through finding a more permanent resolution, which mostly results in long-term stays in (rental) apartments. Contrary to the already existing predominant architectural typologies at the Belgian coastline, the intuitive, but deliberate, choice was made that in this case, the immersion of this architecture into its topography had to prevail over the urge of architectural manifestation. It is an architecture for which almost disappearing is a key condition. This project was a personal, phenomenological quest where I investigated the parallels between a solitary, isolated dune landscape that is gradually changing, man who is continuously looking for a place to hide from his daily life, and a building that would, more than elsewhere, clearly record and reveal traces of time through various patterns.[4] It was an experimental research project whereby the design was conducted with an explicit (but deliberately intuitive) intention. The research was established by means of (1) walking, which involved the thorough explorations of different sites and which caused for a second research action to occur: (2) the writing of detailed reflections (diary descriptions) about the walks (journeys) in the first stages of the research. Subsequently, (1) and (2) lured out a third main and most important research action which is (3) analogue architectural drawing. As is to be seen in the film, The Architectural Drawing (TAD) (Van Den Berghe, 2010, 2013, 2015, 2015, 2018) was applied in a critical sequential way and with a special interest in the vertical section (Fig. 2).

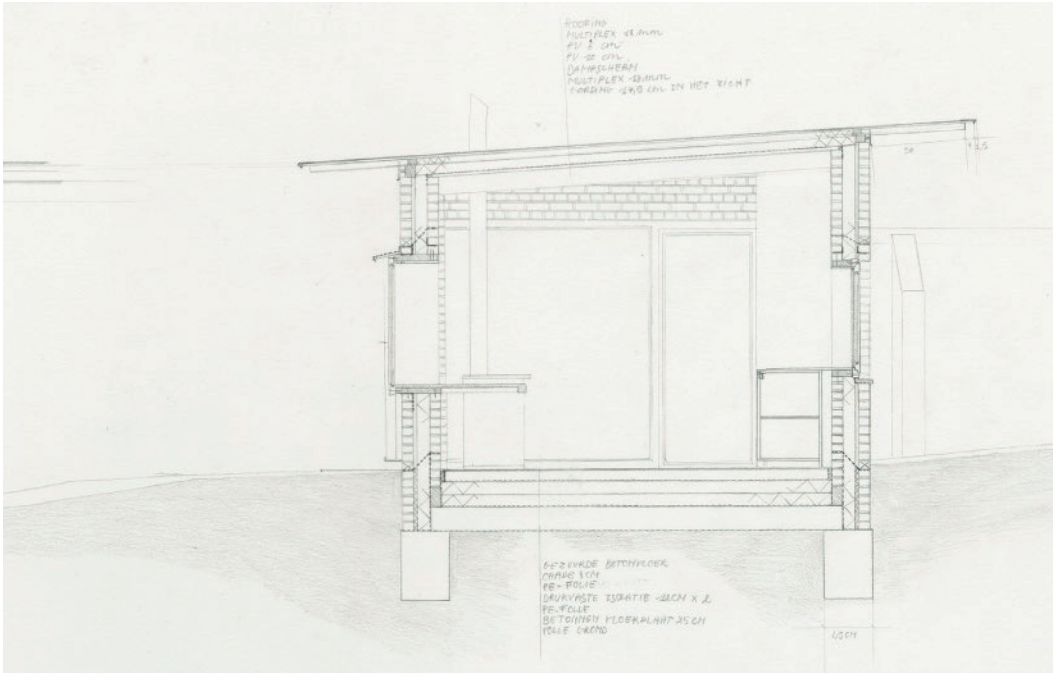

Figure 2: Final vertical section of a refuge that was designed at the Belgian coastline.

[4] After a while, wind, the salted atmosphere and the whirling sand exert their forces on buildings, which evolves in site specific, palpable attrition.

Subsequently, the same subject—whether it is a topographic map, a section, a detail or a plan—was consequently and repeatedly redrawn, forming a cycle of drawings (Critical Sequential Drawing or CSD, Van Den Berghe, Sanders and Luyten, 2018). Every sequence produced more improved and more accurate versions of and mereological dialogues between the previous drawings, even when there was just the slightest difference in appearance. In this manner of working, the sequential application of (the) analogue architectural drawing was able to cause critical shifts in thinking, hence in the design process. By drawing a speculative design proposition that questioned the existing typologies—the high-rise apartment buildings—that habitual ways of seeing and collective memories seem to qualify as 'normative,' the potential of architectural interventions in this (fragile) topography has been investigated. According to Steven Holl:

> "Architecture does not so much intrude on a landscape as it serves to explain it; illumination of a site is not a simplistic replication of its 'context'; to reveal an aspect of a place may not confirm its 'appearance.' Hence the habitual ways of seeing may well be interrupted." (Holl, 1989, p. 9)

The question arose, if an architectural intervention could be designed in a fragile topography without adversely affecting and especially subtracting the cultural value that is inextricably entangled with the site, hence largely 'illuminate its nature'.[5] The current doctoral research is banking on the firm belief that architectural design has a strong potential to do that. I am ending this paragraph with the same subject as the one I started with; the site. This intriguing, gently rolling and gradually changing dune landscape that was my main anchoring point, a fascination and the source for the illumination of my memories in the (relatively short) timeframe of this process.

In the current doctoral research, which is situated in the field of Design Driven research, it is the intention to investigate the possibilities and potential of architectural interventions in fragile topographies (cfr. supra) and to mainly do so by means of drawing. The research will further investigate how and to what extent alternative typologies, generated through architectural hypothesis, can unveil insights in the mechanisms that are at work in design processes in architecture that seem to open gateways and contribute to the aim to retain the cultural value connected to these topographies. The current research encompasses four elements, starting from a twofold: (1) close observations of fragile topographies, in which walking plays a substantial role as a method to collect data (Sanders, 2017, Rousseau, 1776-78). (2) Critically questioning the moratorium on designing architectural interventions in these topographies. The dialogue between (1) and (2) is activated by (3) (the act of) drawing. The process of (4) writing runs parallel to the drawing process as a tool of verbalization that makes both the critical assessment of the drawing process and its outcomes (drawings), and the critical investigation of the dialogue between fragile topographies and the moratorium explicit. Moreover, by doing so, innovative types of architectural drawing, like *Critical Sequential Drawing* (CSD) (Van Den Berghe, Sanders en Luyten, 2018), will be further developed.

Some critical questions

This paper is perceived as an opportunity to address and answer two questions. Both of them have a direct connection with the terminology that is depicted in the working title of the aforementioned Ph.D. project (*Sacred Grounds: (drawing) methods to generate alternative typologies and added value for fragile topographies*) and in the title of this paper. These terms ask for clarification: Why analogue drawing? What is a fragile topography?

Why analogue drawing?

A first, and not insignificant (but subjective), enlightenment in answering the question of 'why analogue (architectural) drawing,' is that analogue drawing has a substantial presence in my personal history. It was only partly triggered through my education as an architect. The origin of this fascination can be attributed to my childhood, when I was looking at how my grandfather was drawing and making things for the house he lived in. He took me to a local academy where I first developed drawing skills.

Secondly, analogue architectural drawing is deeply rooted into the history of the architectural discipline, especially in my Alma Mater, KU Leuven Faculty of Architecture, formerly known as Sint-Lucas School of Architecture. For as long as the term 'architect' or 'architecture' is used, drawing has been an essential and a substantial element to the discipline. Whether through plans and sections or details of hypothetical or realized structures in situ, drawing—the indispensible tool of representation,

[5] This stands in diametric contrast with the 'Concrete Stop' that the Flemish building master and government want to introduce by 2040. Thereby building in open spaces will no longer be allowed.

visualization and exploration—lies at the very heart of architectural discourse (Becker and Dunlop Fletcher, 2014), practice and education. For a long time, analogue architectural drawing has been the architects' only tool to visualize ideas and communicate his concoctions. To be a good architect, one had to be a good draughtsman (Van Den Berghe, 2013). This notion has been lost over time because innovative tools such as digital (drawing) programs have made their appearance and are still becoming more and more developed. As I graduated recently, I can endorse the stance that students—future architects—are eager to deepen themselves into the knowledge and mastering of these new techniques but thus often lose the grasp over the technique we call analogue architectural drawing. E.g. computers, laser cutters and 3D printers are useful and substantial innovations in the present timeframe. Over time, they replaced drawing tables. A shift in perception occurs; digital (drawing) techniques are rightfully convenient now, but that happens at the expense of a long tradition of analogue architectural drawing, which is now often considered as 'too difficult' or even irrelevant.

Currently, we can detect a renewed interest in the analogue architectural drawing (Flores and Prats 2014, Merrill 2010, Spiro and Ganzoni 2013, Marjanovich and Howard 2015). Without wanting to annihilate other digital drawing techniques, I too prefer to leave these digital techniques to the interests of others. One may argue that these techniques may be too dominant in contemporary architecture. This dominance is combined with the observation that analogue drawing is closely connected to the draughtsman's feeling of scale and physical and mental involvement in a design process. Drawing by hand (and model-making) creates a haptic contact between the maker and the object or the space that is created. Analogue drawing both ensures that the design process is not a passive retinal journey and that our magnificent, multi-sensory, simultaneous, and synchronic capacities of imagination are not flattened (Pallesmaa, 2012). The distinction between analogue drawing and digital drawing lies in the physicality that is paired with the process of drawing by hand. While hands move, we have the time to think and observe what we are doing. Drawing by hand increases the draughtsman's physical level of consciousness because the tools are connected to the hand's slowness (Flores & Prats, 2014). Drawing by hand allows for *slowing* as an indispensible condition through which an *embodiment* (embodied knowledge) occurs. Critics might argue that drawing by hand is not a slow action, since it often takes more time to make digital drawings. But it depends on the draughtsman's purpose, what he or she wants to depict in a drawing. Is it a quick sketch to create an understanding between two negotiating parties or a carefully detailed section intended for the craftsmen, or most importantly for this research, innovative types of architectural drawing, like Chronological Drawing or X-Ray-Drawing (Van Den Berghe, 2013), that are intended to gain insight and new knowledge production? Subsequently, drawing by hand and the increased level of consciousness it evokes, on their turn forge the architect—parallel to *slowing*—into a mode of *cautiousness* towards the site that is the subject of investigation. Both *slowing* and *cautiousness* are considered as indispensible conditions to circumspectly handle fragile topographies. This is an awareness that emerged through intensive drawing processes and reflections upon them. The sequential application (cfr. supra) of the analogue architectural drawing is crucial here, and indispensible in constructing the narrative of consciousness. Through consequently and repeatedly drawing and redrawing the same subjects—whether they are topographic maps, sections, details or plans—improved and more accurate versions of these previous drawings are produced and form individual sequences of iterative knowledge production. On their turn, together, these sequences form cycles of drawings—dialogues between different types of drawings occur—that evolve into an autonomous, imaginative, tangible design proposition (hypothesis). This process is called *Critical Sequential Drawing* (CSD) (Van Den Berghe, Sanders en Luyten, 2018). These repetitions, of which each step is well considered through constant self-reflection, cause shifts in thinking due to the immersion that occurs by the stubborn repetitions of analogue drawings. These shifts in thinking are caused by the awareness of the capacity of the drawing to transgress from a representative level, where the drawing merely acts as a communicative tool, into a tool of slow and intense knowledge production. This immersive process induces an increased level of consciousness of the maker of these drawings. Every type of (architectural) drawing can possibly be susceptible for use in this research method. In a first stage, CSD will be applied on drawings made while walking and prospective images for the investigation of fragile topographies. In a second stage, CSD will be applied on topographic sections through which new architectural interventions will be generated. Simultaneously, CSD will be the subject of further investigation in its own right in the current research in order to forge an in-depth development of this method.

To invigorate these stances, the decision was made to purchase new drawing tables because it would not only be beneficial for the current research, it would also incorporate a symbolic message.

What is a fragile topography?

The use of the word fragile suggests that an object is easily broken or damaged, easily destroyed or threatened or that a person is not strong or sturdy but delicate and vulnerable (Oxford English Dictionary 2018). Opinions on the determination of a fragile topography vary because on a certain level, it is always a personal, subjective matter. Only when various people share the same opinions, one's stance can be generalized. Terms such as ecology, heritage, and conservation are strongly connected to the context of a 'fragile topography' because fragile, in architectural terms, can mean that slightly altering the microscopic surface of an object or space can be tantamount to losing the very qualities that make it valuable (Otero-Pailos, 2016) and thus implies that a topography is not fragile an sich, but that it becomes fragile when one commences drawing and projecting imaginations in and on it.

From a spatial-architectural point of view, it seems that in the current *Zeitgeist* governments emphasize the importance of preserving a range of sites through shaping a common thought in which it is expected that these sites are preserved and left untouched. Felix Guattari states that due to the pressure of capitalism and market forces, human subjectivity, in all its uniqueness—what he calls *singularity*—is as endangered as the rare species that are disappearing from the planet. Human subjectivity is fragile as well; we tend to think what everyone else thinks, we feel the same as everyone else (Guattari 2000, Lähdesmäki 2016). This has an influence on the qualification and assessment of for example historic resources and nature reserves. The 'hands-off' stance of (by capitalism's mass-media) newly moulded types of individuals on historical sites, on natural landscapes or urban sites prevails. This normative mind-set has become a deeply rooted phenomenon in our society.

Fragility is present in many ways and on different levels in this research, not only in the context of a fragile topography. Hence, the content of these paragraphs is not merely limited to this context. Fragility is also expressed in the fear of losing the cultural and economic value (Frank, 2015) of these topographies through the insertion of new architectural interventions. E.g. dune areas alongside the Belgian coastline or heritage in the city of Bruges are examples of quasi-objects (Serres, 1982), they are used to shape our subjectivity to such an extent that we cannot imagine ourselves, or our participation in culture, without these objects or spaces in their actual state (Otero-Pailos, 2016). I share this opinion in the sense that these topographies should be handled with care and caution before altering them, because they have social, historical, cultural, and educational value. But for the architect, there is little space for imagination, invention, and intervention because they are assumed not to build in them. Hence, architecture seems to lie under a moratorium on building in these topographies and hesitating to critically question it. Part of the underlying purpose of this research is to try and breach this moratorium through drawing (cfr. supra) imaginative design propositions. Fragility also occurs in these spatialities that were and will be developed and in the actions that are undertaken to obtain them—the walking, the writing and the drawing. It occurs in the close observations that are made and that will be the basis for both deliberate, objective choices and tentative, intuitive interventions.

There is a multiplicity of definitions and explanations of the word fragile to give, which indicates that even in trying to trace this fragility, caution is required. Its content cannot be captured in one definition, description or image (Lagrange, 2016). We are embedding the notion of fragility in a layered discourse, rather than trying to define it in the literal sense of the word.

The answers on these two research questions as stated above, need to be further refined through more research which can be done through reading and thinking but most of all through drawing. More particularly through the use of analogue drawing as a method to test and assess the potential of sites as fragile topographies. A remark took shape in the course of the writing of this paper in that the answers on these two questions could be considered as argumentations that substantiate a third question: Is it not relevant to constitute a dialogue that also includes the aforementioned 'refuge' in the narrative of this research? This arouses supplementary questions: Is the fragile topography the necessary condition to have a refuge? Is the 'refuge' that deep human necessity that cannot be averted by the desired 'Concrete Stop,' just because the 'refuge' is humanly indispensible? In order to provide a relevant answer to these questions an in-depth research is needed with regard to this stance and can possibly constitute the basis for a future paper.

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SPATIAL DISCLOSURE THROUGH PERSPECTIVE DRAWING
ON THE GENESIS OF 'NEW SPACES' AND (IN)SIGHTS

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SPATIAL DISCLOSURE THROUGH PERSPECTIVE DRAWING

On the genesis of 'new spaces' and (in)sights

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Abstract
Since the renewed interest in pictorial depth in the late 13th century and the invention of the mathematical method of perspective in the early 15th century, the perspective drawing has foremost be employed as a tool for two-dimensional representation. However, this paper argues that it could play an active role as an instrument for two-dimensional production through which new spatialities are generated hence further reflections on ways we look at space are provoked.

By taking on architecture in selected Proto-Renaissance paintings as cases, and disclosing what hides behind the fourth wall by the means of the projection method, new three-dimensional contexts emerge. These decors are subjected to a process of hand-drawn perspective interventions combined with modelling and writing, and transform by this chain of actions and reactions in new spatialities that appear to be unpredictable and in no other way conceivable.
Originating from the master dissertation Perspicio (Beke, Van Den Berghe, Lagrange 2017), this early-stage PhD by design, mainly conducted by pencil on paper, requires (self-)reflection in action and a physical embodiment in order to guide the lines that generate new spaces and insights.

The drawn spatialities that take shape before our eyes could tell us something about how space reveals itself to us and about the way perception can be deceptive. We argue that the perspective drawing has the potential to be deployed as an instrument for creating or revealing new spaces, a mechanism used for three-dimensional production as presence. This research investigates the underlying mechanisms of this potential, and the applicability of such mechanisms on a more general level of investigation, production and understanding of 'new space'.

Key words: perspective / analogue drawing / research by design / proto-renaissance / self-reflection

Contextualization

The issue of perspective has always been an ambivalent topic, stemming from a long history with a broad application range. Out of the various types and styles with different intentions that have come about during the cultural development of western civilization, this research confines itself on the (search for) central perspective of the (Proto-)Renaissance and the role it could play today in the generation of 'new spaces' and in reflecting on how we look at space.

When looking back on the evolution of the representation of space in western tradition, particular attention has to be paid to the concept of perspective. The interest for the development of pictorial depth, and with it a more accurate architectural depiction, was reinitiated from the late thirteenth century, the Proto-Renaissance (Burckhard 1868, Auerbach 2003). In this transitional period artists-architects were looking for a way to show more accurately what they see and what they want the onlooker to see. Gradually the iconography from Early Christian and Byzantine tradition evolved from static, hieratic and mystic images, towards a simplified depiction of reality, with a sense of the elegant and the humane (Janson & Janson 2001). Over the years frontal representation evolved towards foreshortened and oblique, resulting in the invention of the geometrical method of one-point perspective by Brunelleschi in the beginning of the fifteenth century in Italy (White 1967). This meant the introduction of the interrelated station point, horizon and vanishing point: the parameters needed to construct a drawing that represents space and proportions geometrically accurate and emotionally credible on a two-dimensional plane. It was around 1474 that the painter-mathematician Piero della Francesca wrote his manual for this new scientific technique of perspective drawing, *De Prospectiva Pingendi* (On the Perspective of Painting). This treatise considered for the first time[1] the intellectual exploration prior to and during the spatial exploration. The operation of thought and the awareness of the (optical) relation between eye, object and surface became shared knowledge (Casale 2016).

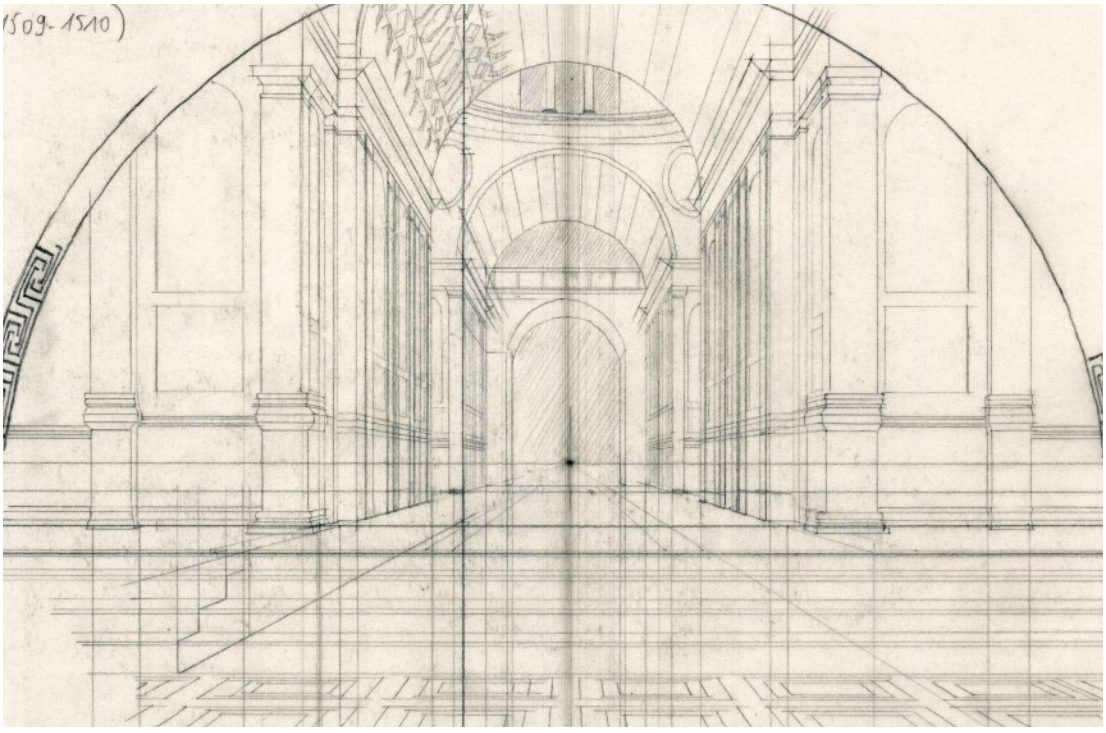
1 Piero della Francesca was not the earliest author of a treatise on perspective. But different from *De Pictura* (On Painting) by Leon Battista Alberti (1435), a theoretical treatise on painting, Piero della Francesca wrote with *De Prospectiva Pingendi* (On the Perspective of Painting) an innovative practical manual on perspective along with its a scientific foundation (Andersen 2007).

Objectives

Returning to this hinging period in history between the late 13th and the early 15th century (including what is called the Trecento), Proto-Renaissance paintings will be selected as cases. The painted (architectural) scene presents itself as the field wherein the researcher can perform his/her perspectival explorations. The current lack of specific architectural knowledge concerning represented but partly hidden spaces will be dealt with. As will the relationship and field of tensions between the traditional way of constructing space in a painting and the reconstruction of the painted space. Frescoes rather than paintings on panel will be chosen for their actual spatial relation with the architectural context they are part of, and will be construed with pencil on paper. This way also the relationship between the historical context and contemporary practice will be questioned.
From these challenges follows the gradual establishment as we go about concretizing the predetermined objectives: a first is to investigate, by drawing plans and perspectives, the depicted space and hidden space in a series of original Proto-Renaissance paintings, situated in their specific architectural setting. This in order to come to a better understanding of these spaces and the relationship with their architectural and historical context.

Thereupon a second main objective is the explorative genesis of new spaces and forms of space through this way of understanding, and learning about their characteristics and observational relation with both the visitor and architect. This genesis coincides with the shift from embedded drawer, as described above, to autonomous drawer who is launched from within the historical context. For there might be an untouched potentiality of perspective drawing to be activated regarding the conception of new spatialities – provided that a critical self-reflection is introduced. Perspective has most of the time been utilized as a two-dimensional instrument, in a search to come closer to the reality of the world. However, this research argues that the perspective drawing has the potential to be deployed as an instrument for creating or revealing new spaces and as a mechanism used for three-dimensional production as *presence* – next to the initial use for two-dimensional *representation* –, engaging its rules for constructing a view as a spatial propeller. This research aims to unveil these underlying mechanisms, and their eventual applicability in the exploration, production and intersubjective understanding of 'new space', by the means of drawing by hand.

Throughout the whole research the significance of the role of the (subjective) Self in these processes, and the importance of analogue architectural drawing in a context of digitalization will be valued.



detail from projection 'The School of Athens' by Rafael (Beke 2017)

Research origins

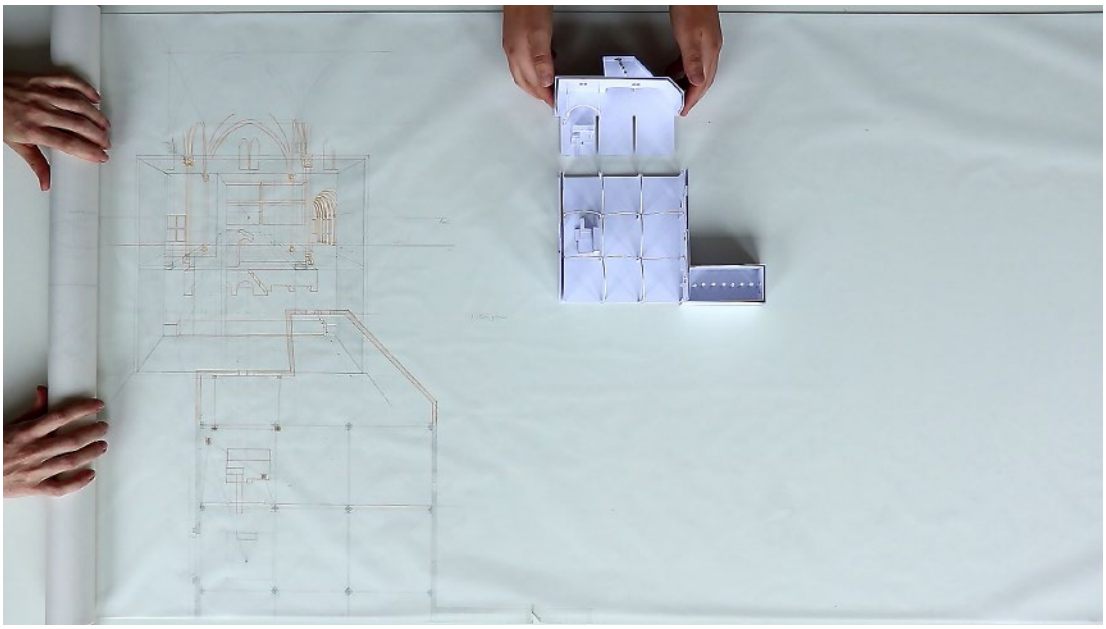
This research project intends to go behind the picture plane, the two-dimensional surface on which a three-dimensional scene is depicted. By taking on architecture in selected (Proto-)Renaissance paintings as cases, and disclosing what hides behind the surface by the means of the projection method, new 3d contexts emerge. The fourth wall can be permeated, and since the frontality is bypassed, the registered space is now a three-dimensional place that can be approached from different angles. The master thesis *Perspicio* (Beke, Van Den Berghe, Lagrange 2017) already allowed developing a first series of explorations, starting from the work of Bramantino (The Adoration of the Kings, about 1500), Antonella da Messina (Saint Jerome in his Study, about 1475) and Giotto di Bondone (Expulsion of Joachim from the Temple, 1304-1306).

By reversing the projection, plans and sections could be obtained from the painted surface, providing us with a fictional space that can be walked through. The architectural decors, extracted from the paintings, were subsequently subjected to an empirical process of hand-drawn perspective interventions combined with modelling and writing, and transformed by this chain of actions and reactions in new spatialities that appear to be unpredictable and in no other way conceivable, but emerging out of patterns that are generated by the lines inherent to the method of projecting.

These first productions act as the foundation for the more defined doctoral research here presented, which will be dealing with iconographic and iconological aspects, an expansion of the repertoire with cases to be researched, and the continuation of new spatial production.

In so far this early-stage research project has progressed, a literature study has been conducted and a reflective film[2] has been produced looking back on the first series of production. This *Bootleg* (Beke, Van Den Berghe, Lagrange 2017) shows the – literally – unwinding of the design driven research discourse: a roll of tracing paper, containing the first drawn results and related models, is manually retracted showing the pictorial explorations.

The following step revolves around the next cases. These cases – specified further on in this paper – are deliberately chosen and preliminary studied by the means of literature and drawing for the purpose of setting up a fieldtrip to experience these paintings in their actual spatial context. This primary examination within the framework of a specific past, characterized by its layered complexity, is essential to be able to distill particular aspects that will play a part in this more explorative and sensitive approached PhD project.



still from Bootleg, Perspicio (Beke, Van Den Berghe, Lagrange 2017)

2 link to *Bootleg* (Beke, Van Den Berghe, Lagrange 2017): https://vimeo.com/250011509

Method

During the master thesis the cases were foremost selected on an intuitive basis. Paintings that appeared to be interesting and challenging were chosen, enabling to explore works from different types and times, out of curiosity. The following research cases, however, do meet certain criteria that lend a greater focus regarding place and time to this PhD project, but still the aspect of intuition will be included. In *The intuitive practitioner* (2001) Guy Claxton describes the rehabilitation of intuition as largely seeming a matter of regaining balance: 'the balance between effort and playfulness (…) and the balance between intuition itself and reason.' Or as mathematician Henri Poincaré claimed, 'It is through logic we prove; it is through intuition we discover' (quoted in Claxton 2001). Considered as implicit knowledge in an indispensable preceding stage of explicit knowledge, intuition will retain its importance in this PhD, but now framed in a more specified context.
For this the research tends toward the fascinating period of Trecento, where artists wanted to break out of the rigidity and two-dimensional tradition, and became aware of the possibilities of depth. These paintings, dating from before the linear perspective was invented, may seem more simplistic and primitive, as opposed to the harmonious paintings of the Renaissance, but in fact they might even be more complex and spatially intriguing. The artists started experimenting, looking for a solution to deal with the conflict of the solid and the surface (the large-scale, three-dimensional, lived medium of architecture versus the small-scale, two-dimensional, fictive world of a painting), resulting in fascinating architectural 'objects', that may play a role in the story of the painting, rather than just providing a background for the protagonist.

Leading us to the (personal) selection criteria as listed here: for a case to be selected it should be (1) an Italian early Renaissance painting, where (2) architecture is represented – with its time-related defects and deformations. It should be (3) a fresco, so that it is a big compositional organization, embedded in its architectural context. This way the painting has its fixed position and orientation in a bigger whole, in relation with other depictions. As opposed to a (relocatable) panel painting, which can be less physically related to or defined by its built setting. And (4) preferably it should be part of a cycle. So that the different frescoes are not only organized as they are because of mere formal aspects, but also because of the narrative that binds them and that can provide the drawer with a motive to define the starting position, making use of the constructed *détour* of fiction as a method to gain understanding of 'the real'.

Based on the aforementioned criteria the further selection of cases will be done and finetuned through *coding*, a method borrowed from Grounded Theory Research (Corbin and Strauss 1990, Charmaz 2000, Charmaz 2006): *open coding, axial coding and selective coding.*

Once the represented architecture has been studied (through literature review and site visit) and transformed via projection from a plane (2D) to a solid (3D) – the perspectival projection method as hinge between the idea and the experience –, the three-dimensionalized space will be subjected to a first round of hand-drawn perspective interventions, alternated with modeling and annotating (*memo writing*). These interventions, that constitute the *open coding*, are directed by application of the rules implicit in the geometrical method of perspective drawing.

Focus will be developed through *axial coding*. Tracing the projection lines and sight lines, defines gradually unforeseen patterns and new spatial constructions. This transformation seems to be unpredictable, and apparently ensuing from this chain of drawn actions and reactions that are the result of a sensible form of intuition (Claxton 2001).

The fictive field of the three-dimensionalized painted architecture itself provides the motive for the actions and reactions that take place. It is the narrative of the painting (to which depicted architecture often metaphorically refers to (Lillie 2014)) that acts as the catalyst for the perspectival intervention. In this manner the cases behave self-supportively and recursively as spatial conditions are created in accordance with requirements of the story. The assumptions that are made for architecturally supporting and/or reinforcing this narrative (like a stage setting), provide the motive for the behavior of draughtsman and drawing to be determined by the perspectival rules. Drawing is no longer autonomously deciding, but being guided by the mechanism of the projection method and hypotheses that give a guiding orientation to perception and thought, giving the general meaning that allows 'seeing' facts 'as' this or 'as' that (Besse 2001). A position is taken – literally – and subsequently the perspective will determine the directions and generate patterns that create new spaces. The outcome of the new spaces depends on the balance between the mechanism of the technique, to which the draughtsman subjects him/herself to a certain degree, and the authority of this draughtsman, who defines the station point at start and intervenes were required. The delicate balance of authority between drawing and draughtsman demands (self-)reflection in action. The system generates from within, subjected to the rules of perspective that also the draughtsman is highly susceptible to. He/she observes and anticipates on the self-generating processes that take place before his/her eyes, weighing whether to obey or disobey these rules. At this stage, the exact outline of the criteria and their ratio for achieving the required balance and a successful formation of a spatialitiy must be empirically examined throughout the process.

Thoughts on Theme 1: The Act of Drawing

The search that the early Renaissance painters initiated, is in a way continued here. Analogous to what took place more than 500 years ago, this research is exploring the limits of an instrument that today no longer (instead of 'not yet') automatically belongs to the general competencies of graduates. Preceding on what was, it seems only logical to conduct this research by analogue drawing, linked to the explorative drawing practice of that time. This principle of embedding, though not in full aware of the authentic practice and thus in need of other solutions to tackle the gaps one encounters when retracing, will require a strategy and method. Intuition, imagination and memory can therefore become part of the game when deconstructing and reconstructing the pictorial space, bringing about (potentially interesting) anachronisms, but also enabling a sensitive relation with and a way of understanding of the image making.

The invention of photography in the 19th century and the digital revolution that would follow later on, had put an end to the classical painting tradition as it was and slowed down perspectival developments – which does not imply that further developing would be dispensable. In the current architectural education the focus is foremost concentrated on drawing digitally, using commando's that draw lines in the boundlessness of a virtual program. Drawing by hand is barely taught (and possibly underrated?) in the architectural training of today, hence the challenge for this investigation of self-teaching, facilitated with an *old school* drawing table, those techniques that were still obvious for the students of merely some decades ago.

Retracing those steps in this stage of the research has several consequences, whether of practical matter or personal (both mentally and physically) impact. On the one hand there is the size of the drawing related to the size of the medium. Once the first lines are drawn, the position and scale are set. It is thus of great importance to reflect on the intended drawing on beforehand and already consider by imagining and calculating how it would fit the bearer. A second practical difference with digitally obtained images is the number of lines. There is a (sometimes even confusing) multitude of lines when doing a perspective projection by hand. Besides the lines that trace the architectural forms, the sightlines, projection lines and orthogonals converging towards the vanishing point also remain visible. This way the process is literally represented, and unforeseeable patterns may emerge and become part of the newly constructed space, addressing the indirectly forming potential of the perspective mechanism.
These limitations ought not to be considered as disadvantages. Not only do they help provide in the generation of new (forms of) spatialities, but the slowing act of drawing may be rather a process related hence not merely a product related activity, which leads us to the personal impact of drawing. This process related nature much more, i.e. longer in time during the drawing process, brings about embodiment. Constructing embodied knowledge requires periods of embodiment that last long enough. Embodiment, here, is indispensable because the experience of space, hence the conception of space, is also physical. The direct link between mind and hand affects both a physical as well as mental involvement and addresses a depth and intensity, crucial to a conscious genesis of new spaces and a further development of The Architectural Drawing (TAD) (Van Den Berghe 2013, 2015, 2015, 2018) via *Critical Sequential Drawing* (Van Den Berge, Sanders, Luyten 2018). With the drawing almost as a physical extension to one's body and no possibility of 'zooming' within the set scale, drawing becomes walking, and what the draughtsman compellingly sees is what the draughtsman compellingly gets. This helps to both physically and mentally inhabit the imagined, inviting the Self to consciously overthink and interact, and enabling the guiding hypotheses to be tested. (Besse 2001).

Thoughts on Theme 2: The Act of Looking

The spaces arise from a continuous interaction between planimetry and a certain sight from within in the form of a perspective drawing. This sight is determined by the position of the draughtsman, his orientation and eye level. When drawing a linear perspective a station point and a vanishing point are defined, two coordinates upon which the whole spatial construction is founded and thus decisive for the perception of distance and proportions. The experience that can be derived from this one specific station point, shapes the expectations in regards to all the other points of view. Man is preprogrammed to identify systematically the harmonious or symmetric, and hence preprogrammed to expect it (Sternberg & Sternberg 2009)[3]. When a station point and projection lines determine a drawing, and in extension the spatial development (for they are inextricably linked through the interaction between planimetry and sight), all the other views will be affected and their reality will not always be instantly reconcilable with their appearance, for the onlooker's perception will change when changing position. The completion of space takes place while making an architectural promenade, moving from one station point to another. When spatial explorations in pictorial depth result in an experience that doesn't meet visual expectations, then the estranging elements impact the space and create non-conventional tensions. The distortion, firstly appearing to be logical,

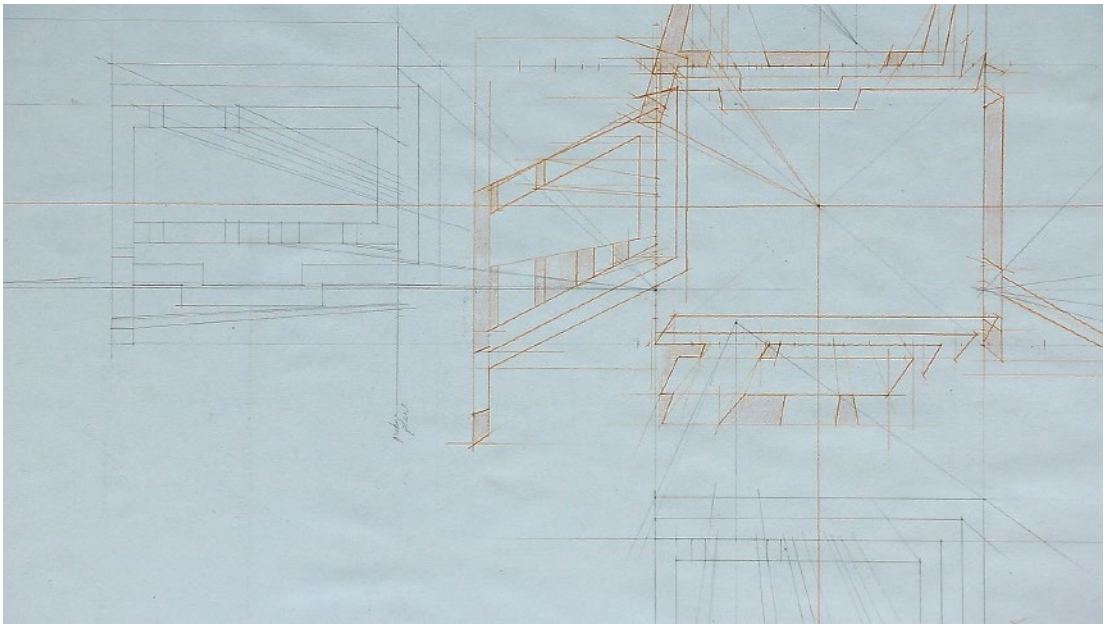
3 The Gestalt psychology in the 1920s (founded by Kurt Koffka, Wolfgang Köhler and Max Wertheimer) studied the visual perception and developed the law of *Prägnanz*. One Gestalt principle that is described by this overarching law is the principle of symmetry, which states that man tends to perceive objects as forming mirror images about their center (Sternberg & Sternberg 2009).

now causes to doubt, and attempting to comprehend it will cause to waver. This disorientating game of viewpoints can make the onlooker slow down, inciting him to look with an improved awareness, in an attempt to understand the destabilizing provocation and the relationship between the registration that the eyes transfer to the brain and the body that has its own specific position and orientation in space. Perception, and vision being regarded as self-evident, are questioned in a space that is unconventionally composed, breaking free from orthogonality. In *Meaning in the Visual Arts* Erwin Panofsky (1983) states "…that much is in the senses without ever penetrating into the mind. We are chiefly affected by that which we allow to affect us…", implying that awareness is an initial step towards the obtainability of (spatial) insight, for there is generally *more than meets the eye*.

A first critical stance has to be adopted towards the way we perceive historical images today and the role of linear perspective, for art historian Michael Baxandall's concept of the 'Period Eye' (1972) points out that our vision is a cultural construct, based on skills and social habits. Different interpretations related to what was historically intended and actually perceived are a posteriori projected and attached to the experience of the painted image, influenced by the visual training and cultural equipment (Panofsky 1983) we are affected with today as opposed to at the time. It is important to consider that "understanding the picture depends on acknowledging a representational convention" and to relate the pictorial style to the corresponding cognitive style (Baxandall 1972).

A second aspect that is to be approached with some suspicion is the deceitfully scientific position that linear perspective holds within our modern Western cognitive style - even though this seems to be transforming in recent years towards a more aerial view (Steyerl 2012). The paradigm of linear perspective is often improperly regarded as the truthful representation of reality (Panofsky 1991). Instead, it is an intersubjective tool of communication, operated to project the vision of one person: the one in charge of placing the station point. The (abstraction of) the draughtsman's body in the space stipulates the spatial outcome; draughtsman becomes architect.

The drawn spatialities are capable of telling us more about the deep nature of (fictive historical) space, about the way we look at it today, and eventually about the conception of innovative spaces. In this way, they act as The Analogous Spaces (TAS) (Lagrange 2011, 2016) since they are able to unveil the intangible as a crucial part of our beholding. These new decors can work as looking machines that permit us to reestablish this conscious way of looking and drawing, essential activities for architects, in architecture practice and learning environments, with regard to the conception of space and architecture.



still from Bootleg, Perspicio (Beke, Van Den Berghe, Lagrange 2017)

Upcoming

As has been said, the next step is to delve into the selected cases to study. A fieldtrip to visit (the first) two specific cases is planned, to have the crucial experience of beholding the paintings in real life, and not solely their representations on paper or on a screen. The first cycle to witness in its own context, as was meant to be, is to be found in the Upper Church of the Basilica of Saint Francis of Assisi, where both sides of the nave are decorated with frescoes that tell the story of Franciscus in one horizontal band, dating from the 1290s. The identity of the artists is disputed, and can only be assumed, but art historians agree that there were several, based on the different styles of painting. Also clear is that one person must have been in charge, who kept an overview on the whole organization of the cycle and its coherence (White 1967). The second case on the list is the Arena Chapel in Padua, of which we know for sure that the frescoes are by the hand of Giotto, conducted around 1303-1306. Here the lives of Christ and the Virgin are depicted over the whole space in three horizontal layers. The biggest difference between the fresco cycle in Assisi and the one in Padua may lie in how the building itself impacts their formal organization. In the first one, the Upper Church of the Basilica of Saint Francis, the nave is ordered in different bays, plastically divided by columns. In every bay three or four frescoes are applied per wall. They are mutually formed in order to be balanced within the three/four of them, and referring to a center in this particular bay. Every bay has its own center, hence in this case it is all about being part of a whole. The Arena Chapel, on the other hand, has no dividing architectural elements in its interior. The whole chapel acts as one. The cycles that are on these walls are thus more individual, and all referring to only one center (station point) in the middle of the chapel. The two different approaches towards the pictorial strategy (depicted space) within their distinct contexts (built space), approximately dating from the same time, are expected to shine a first light on various aspects, as above mentioned – including the genesis of new analogue spaces (relative to historical conceptions), the self-reflective character of the researcher while looking in a specific way and acting accordingly, and the meaning of the architectural drawing (by hand) in all this as a generator of the creative process.of the creative process.

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EXPLORING IMMEDIATE ARCHITECTURES FROM SPLATTER TO CONGLOMERATES – A PERFORMANCE

THE MAKING OF SMALL ARCHITECTURES

CLAUDIA CARBONE AND
ANGUS JAMES HARDWICK

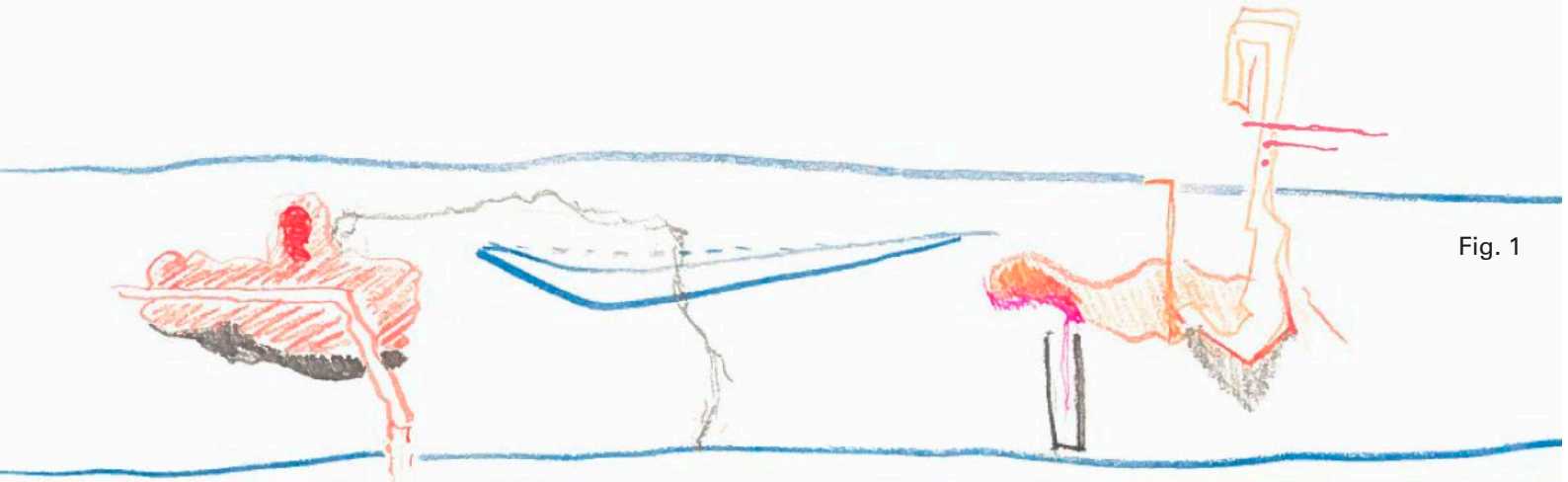


Fig. 1

ABSTRACT

The project proposes the immediate as an instigator to the production of architecture.
A performance (20mins) was our contribution at the 2018 CA2RE conference. With the point of departure in a drawing representing the surface of a Melaleuca Quinquenervia. The paper is structured as a journey unfolding the research in four sections.

With the aims of exploring spatial potentials through alternative and collaborative design processes, the project introduces improvisation, bodily actions and temporal inhabitation across a range of scales as deliberate techniques. The project explores ways of designing new grounds for small architectures to occupy and territorialise space. The purpose of this research paper has been to capture, articulate and reflect on different concepts and methodologies relevant to this ongoing artistic research.

THE ESSAY

The Surface As A Condition For Action – exploiting the layering and sequential in the surface
The Interpretations – Spatial, Durational, Formal – intuitive fragments, captured and embedded in the constructed surface
The Performance – The User, Audience – a design process where the spatial structure and human actors are both performing agents

THE PERFORMANCE

The Field And The Arena – a state of change and (self) modification
The Manual For Performance In Plan Act 1 (draft)
Drawing Of The Arena – diagram of interaction and projections – diagram of the events and body relations
Observations Of The Arena – documentation of the actions

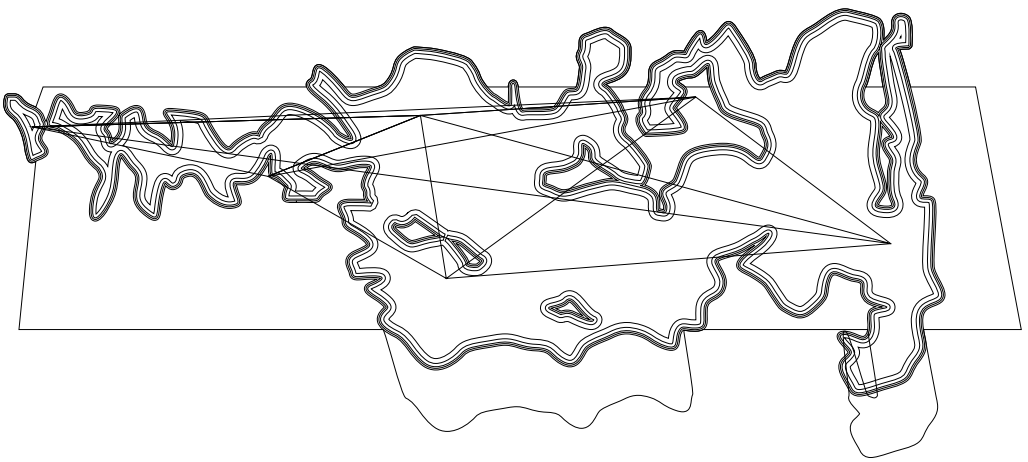
THE EXPERIMENT

Rehearsing Actions – explorative process
The Manual For Performance: Modus Operandi – establishing the situation
Interprative Actions: Tools And Projections – visual documentation

REFLECTIONS

REFERENCES

Fig. 2



KEYWORDS
Architecture
Performance
Surface
Immediate
Splatter - Conglomerates
Artistic Research

Exploring Immediate Architectures from Splatter to Conglomerates – A performance

The making of small architectures

The project proposes the *immediate* as an instigator to the production of architecture. In the making of architecture there are processes that can be deliberately designed or be a subject for a normative procedure, however this project aims to foreground processes and methods that are characterised by non-normative procedures. These procedures and methods embrace the unknown, unplanned, the immediate and the responsive as alternative ways of making that we argue hold unexplored potential in the design and representation of architecture. With the aims of exploring spatial potentials through alternative and collaborative design processes, the project introduces improvisation, bodily actions and temporal inhabitation across a range of scales as deliberate techniques. The project explores ways of designing new grounds for small architectures to occupy and territorialise space.

A performance (20mins) was the format for our contribution at the 2018 CA2RE conference. The work is the result of an artistic research practice within the field of architecture investigating the expanding territory of performative architecture. The point of departure for this experimental research is a large imprint from the surface of a Melaleuca Quinquenervia (paperbark tree) made on a continuous (16000 x 300mm) piece of Japan Paper. This initial drawing was produced through the interplay of laser-photocopying the unmovable object (the tree) and acetone transferring by the action of the hand rubbing.

The purpose of this research paper has been to capture, articulate and reflect on different concepts and methodologies relevant to this ongoing artistic research. This paper is structured with four in sections that contain textual and visual documentation of the artistic research.

THE ESSAY

The Surface As A Condition For Action

Explorations in generating architectures from surfaces in transformation are important because they foreground the experiential, the temporal, and the affective exchanges between a specific material and spatial situation and the human body. As a research focus this has given rise to a number of relevant approaches that depart in the incidental and accidental. Here Christian Kerez's 2016 intervention *Incidental Space* [1] and Nat Chard's project *Drawing Instruments* [2: p.34-59] are useful reference projects. Kerez's project was formed with the intent of challenging the role of programme as the primary generator of architecture and was a search for "oppositional space", considerations taken into account in this research project. [1: p.3] The intervention developed from a small crack within a plaster model transformed into an architecture inhabited by the human body. Achieved through the primary operation of scaling, the ensuing intervention is one where the audience are merely observers to the process of making and engaged as participants able to experience the space as they moved through it. Despite the interventions unusual point of departure, and the complex transformations that take place within its surface, the project exists within the conventional framing of architecture as static places for human inhabitation. Our project attempts to challenge a number of assumptions embedded in Kerez's methodology, namely the audience as observers as well as the act of making. The research instruments of Nat Chard engage with performance as a material in the making of an aesthetical, speculative and formal approach towards architecture. However as the audience, we are not included in the act. [2: p.50-51] He territoralise's the ground through splatters of paint, where the space is formed as a result of kinetic mechanical action. However this is not used in an affective way. These results can be experienced as a moving image or a drawing after the event. We as the audience are not invited into using the machines rather, in a classical way, the observer has to project and 'imagine' themselves within the scene.

The performance of *Exploring Immediate Architectures* will exploit the layering and the sequential in the surface of the given imprint. In the act of extracting figures, spaces, perturbances within the one surface – the paperback imprint - it became The Surface. The exploration of singular spatial events in the drawing is viewed as an archaeological "dig" – where the performer and audience question what is extracted or becomes one with The Surface. This expands our understanding of The Surface as an active thing that accumulates and catalogues material, The Archive. As discussed by Carolyn Steedman: "The Archive is made from selected and consciously chosen documentation from the past and also from the mad fragmentations that no one intended to preserve and that just ended there... It is indexed, and catalogued, and some of it is lost." [3: p.68] Eight events have been identified and named within the drawing (on both sides) and the extents have been registered by an immediate act of marking the paper noting different scales directly. The sites were selected for their distinct differences, densities, form, formless, the recognisable … what emerges. In this acts we expand The Archive to incorporate these distinct incidents. We recognise an intuitive potential when investigating the conglomerates, spatters and traces on The Surface, for the acting of an architecture that performs.

T

he Interpretations – Spatial, Durational, Formal

The surface receives multiple action and index's, some interpreted through digital media, some direct action from the performers, others are subjected to transformations and disruptions of spatial events. Through performance these actions became intuitive fragments of the spatial structure as archirtecture. The performance captured and imbedded the construction of the architecture as a lived site. We have studied several alternative working-methods enacted by a number of artists. Artists such as Richard Serra and his displacement of hot Vaseline at the top of the Guggenheim museum in New York City as seen in Mathew Barney's *Cremaster 3* (2003) [4], and Anish Kapoor's *Shooting into the Corner* (2009) [5] artwork where a machine acts as the intermediate between human, matter and architecture, unfold this interplay between architecture and performance[6: p.96-97]. We see 'the result' as something in transformation provoking improvisation. Time is a strong parameter that creates an ordering strata, always in flux.

The Performance – The User, Audience

Within the practice of architecture action, event and temporal interventions have long served as provocations subverting mainstream design methodologies. Early precedents from architects Peter and Alison Smithson 1956 *House of the Future* [7] and Haus-Rucker-Co's 1972 *Oase No.7* [8] project used performative actions to inhabit a predefined material scenography. The material scenography became enlivened when the performing human inhabitant 'acted out' the architecture. These scenographies were conceived in, or appropriated, an existing context in the traditional definition of the word where they become a painterly and graphical representation of a defined space. Performance was used as a method to foreground the lived and experiential characteristics of these temporal architectural speculations. Developing at the same time, and in opposition to these architectural precedents performance artists such as Lygia Clark's 1963 *Caminhando* [9] and chorographer Trisha Brown's 1973 *Roof Piece* [10] developed scenography's that were active and open to ever-changing situations. These performances unfold in defined spatial structures, which were situations that foregrounded the interplay of object, time, performer and audience. In these performances the artists used "transmission and replication as representation strategies" [10] for inhabiting the world. Reflecting on these developments The Surface in *Exploring Immediate Architectures* is positioned across an expanding field, where the performers and audience react / respond to constructed marks on the spatial structure. Questions will arise as superimposed projections of future, past or (actual) events interact/ interferes.

More recently the relevance of performance as a method to represent potentials within architecture was reaffirmed when in 2012 the Architecture and Design Department of the Museum of Modern Art in New York City acquiring their first architecture performance [11], *Ikea Disobedients* by Andrés Jaque. In this performance Ikea furniture is used as an "improvised set" [12] for the performance of private activities within the public domain of the gallery. A consistent theme within many of these projects is that the material installations behaves as a scenography against which the performers respond and react. This project continues the method however seeks to explore the potential of performance as a design process where the spatial structure and the human actors are both performing agents within an assembly of splatters and conglomerates.

In our testing of the performance you can gain an insight in some of the elements and their interplay. The performance was to be performed once at the conference, in this context the project is avoiding a 'final state', which would require multiple ways of preparation, rehearsing actions within The Arena.

The Field And The Arena

Defined by three sequential acts the performance is to appropriate the constructed and established situation. These acts are to include a sequence of repeatable actions across a spatial structure, the arena, for performance. It aims to uncover possibilities from the elements as elastic or abrupt found at the performance site. As Sanford Kwinter indicates "In this domain there exists only dynamic metastabilities or meaning-events (accidents, convergences, subjugations); matter, form, and subjects ("doers") come only later, reintroduced as a second order level, not as ground but as produced *effect.*" (Emphasis in original) [13: p.40] Considering this argument in the making of the performance's sequence and improvisation, we treat the site not as a pristine situation, rather as a field always in a state of change, (self) modification, and a mediation becoming a new situation. Within the performance we allow for uncontrollable or unpredictable micro events in our exploration of Immediate Architectures. There is also another possibility of performance in architecture, where matter is not fixed. There are specific material formations "always in a process of change and becoming" within the constructed situation that embody the ambiguities of the world, as stated by Chris Slater. [4: p.81] Furthermore Slater emphasise the role of collective performance in strengthening the agency of architecture. "Despite the different connotations of performance in the techno-socio-scientific context, the move towards agencies, collectives, and networks articulates a common thread: that humans, things, and matter are not fixed but always in a process of change and becoming." [14: p.112]

THE PERFOMANCE
The Manual For Performance In Plan Act 1 (Draft)

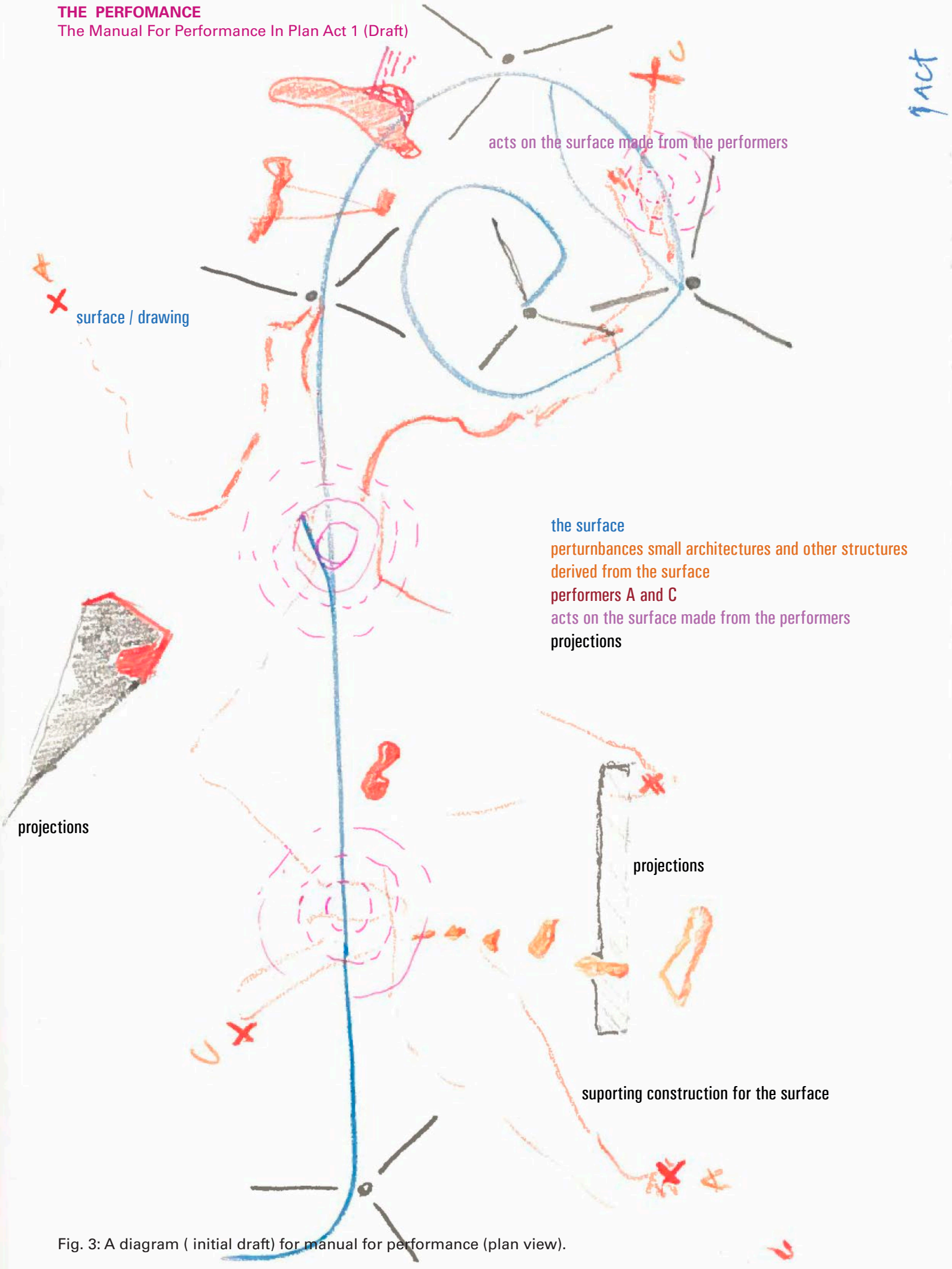


Fig. 3: A diagram (initial draft) for manual for performance (plan view).

Drawings Of The Arena

05 P

projection: dislocated

audience

the surface
events defined on the surface
performer: A and C
acts on the surface made from the performers
projections, audience, spatial structure

04 M

performer A start
mobile camera: dislocated

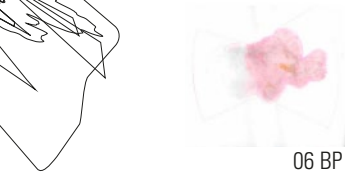
06 BP

03 G

08 H

08 H

07 Ma



06 BP

02 BS

07 Ma

01 K

fixed camera: manipulated

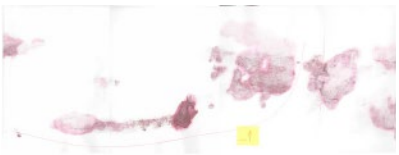
projection: still

05 P

04 M

projection: manipulated

audience



03 G

02 BS

01 K

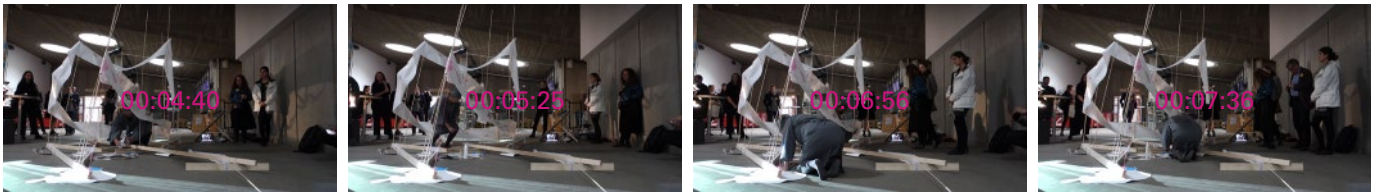
props tools & material for reacting

performer C start

audience

Fig. 4: A diagram of performance

Act 1



Act 2

Act 3

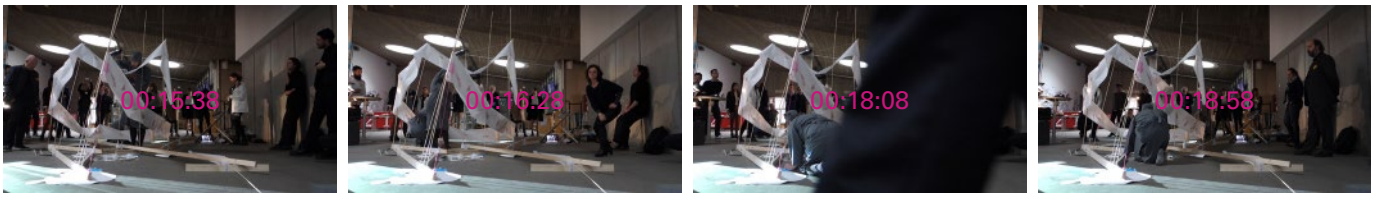


Fig. 5: Excerps from the raw footage, equal division of time unequal duration of The Act.

Fig. 6: Spatial structure after performance, documentation of Splatters and Conglomerates.

Fig. 7 : A-D manipulations of The Surface; E-J residuals captured on the cutouts and redrawn event on The Arena.

THE EXPERIMENT

Rehearsing Actions

Within the repetitive action lays the intention to provoke the improvisation as an inherent result of the disturbances in the drawn field of the prepared construction.

What did the rehearsals revealed?
- Configuration of the The Surface across a spatial structure instead of other organisational approaches (eg points or within a frame) - The vertical organisation of points of interchange: the performers body in relation to print and to each other - Time of movement - Identification and categorising of the eight event sites across The Surface- Indications for how the performs bodies move across The Arena - Selection of three sites for exchange - That the exchanged between performers doesn't have to be simultaneous - Tool for reacting: the 3d print, plaster, wax, the drawn... - The staging and affects of different types projections

The Manual For Performance: Modus Operandi

Establishing the spatial situation from tabula rasa

Two acting performers
The spatial structure for facilitation of the active actions on the drawing surface
The index the prepared grounds of the three events in the realm of the surface to be sites for actions
The three live projections. The still, the manipulated and the dislocated

Pre act – establishing the spatial structure for the performance, preparations on The Surface, props for the performers

1 act Two facing trajectories, performing interventions on the prepared sites
Reset
2 act Two facing trajectories, performing interventions on the interventions on the prepared sites
Reset
3 act Two facing trajectories, performing interventions on the interventions, on the interventions, on the prepared sites

Post act - documenting the new surface – the collection and the archival gesture of dismantling the installation capturing the residue.

Interpretive Actions: Tools and Projections

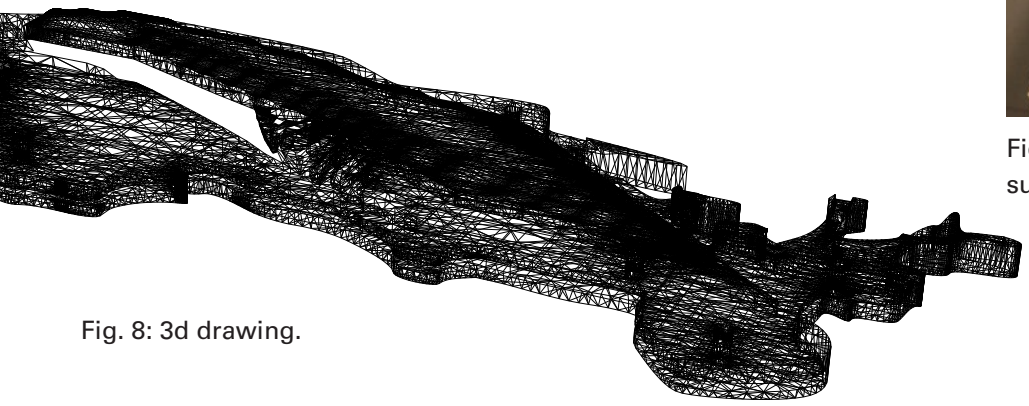


Fig. 8: 3d drawing.

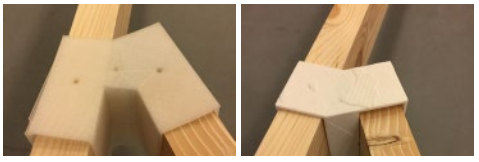


Fig.9: Sequence of 3d print joints supporting the spatial structure.

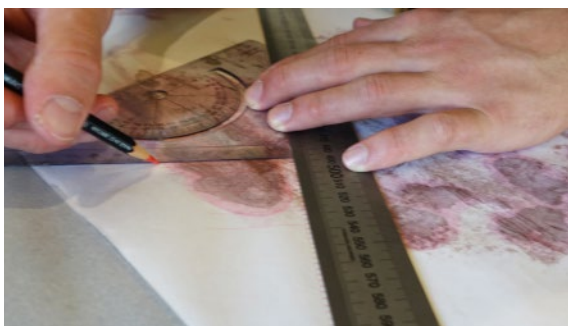


Fig.10: Drawing on The Surface.

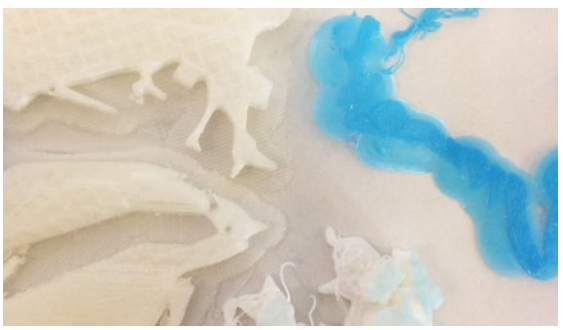
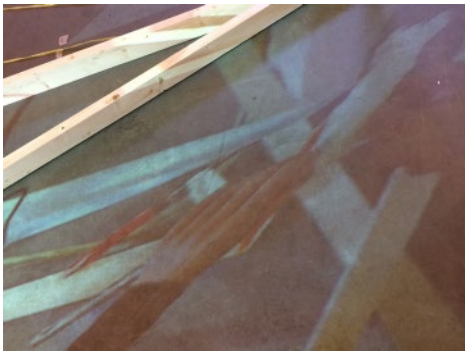


Fig. 11: Printing drawing.



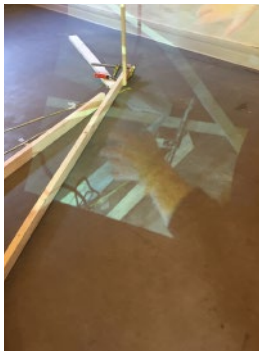


Fig. 12: Sequence of the manipulated projection.

Fig. 13: The dislocated projection.

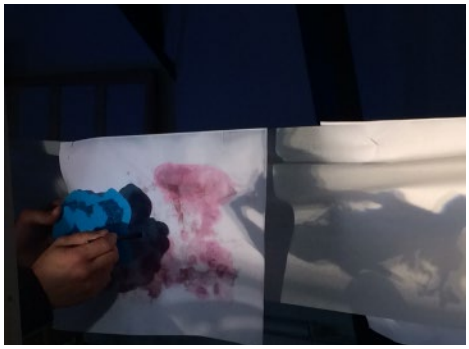
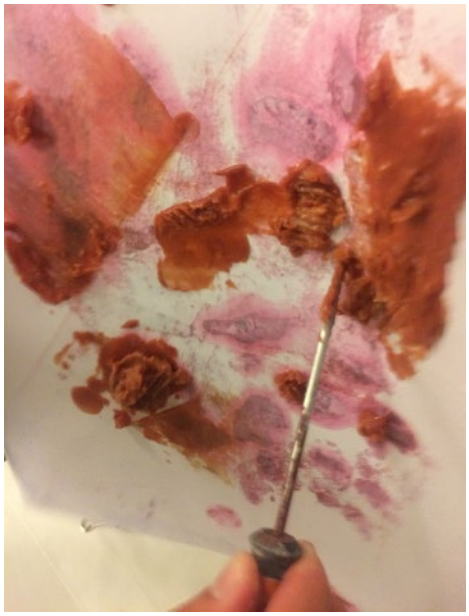


Fig. 14: Sequence of the still projection.

Fig. 15: Sequence of plaster and 3d print manipulations.



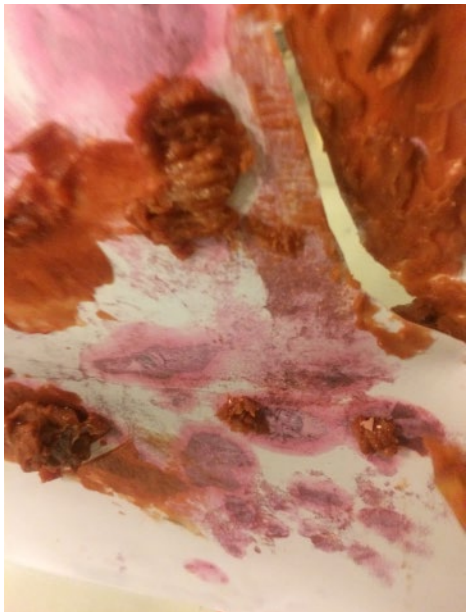


Fig.16: Sequence of wax, cut and smear explorations.

Fig.17: Moment from the performance. Photo Mathias Skafte Andersen.

REFLECTIONS:

The outcome of the project had multiple strains which have generated further explorations and quests. Firstly, we were able to produce The Archive, which comprised of photographic stills of the performance, a raw 20 min recorded film and a collection of the splatters and conglomerates captured by the prepared cutouts and redrawn events. As direct outcome of the conference the film and the collection of splatters and conglomerates are subjects for examination where architectural constructs emerge in these speculative initial sketches. Secondly, as the conference was a test site for an informed, critical, panel we became aware of the different directions the reception and discussion by others (the panel and audience) of the work could develop in. Gaining an understanding of how the work reviewed is useful for future projects where production on different found surfaces and for audiences with different backgrounds could be adapted to propose and add new small architectures in the existing environment, expanding performance to include construction. As an executed event, the performance in its three acts, outlined in the initial manual was able to facilitate an alternative application of participatory design where the performance-event proposed new inhabitable architectures.

The performance also served as a way to reaffirm our understanding of the intelligence of 'The Architect' as distinct from that of 'The Artist'. As architects we engage our bodies in the making of drawings, models and in observation. This bodily engagement always inevitably transforms what is produced, and in turn architects collect and potentially build this residue. We gained an understanding that as architects we use our bodies in a different way to that of the artist. In this performance we were not 'acting' or even 'performing'. Rather we made visible the moments where our bodies were engaged with the matter of the surface in the event of observation, making and reconfiguration. These events were also when we as the researchers expanded our tacit knowledge gaining an awareness of our actions, the material, their interaction and the affects in the making of small architectures.

Fig.18: Impressions of the empty Arena.

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Fig. 19

Figure 1: Initial drawing of the elevation.
Figure 2: Redrawing of event.
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Fig. 20

DRAWING OUT GEHRY
AN ABBREVIATED ESSAY

RIET EECKHOUT

Riet Eeckhout, PostDoc, 2018

Drawing Out Gehry, an abbreviated essay

This abbreviated essay presents thoughts on the production of space within the drawing (in relation to the drawings's proximity to architecture. This reflection operates as an annotation to a set of drawings titled '*Drawing Out Gehry*.

Drawing Out Gehry is a set of drawings in dialogue with Frank Gehry's sketch included in the Boyarsky-Collection.

My interest in the sketch is twofold : it first of all forefronts the autonomy of information within a drawing, in this case, the sketch's capacity to distance itself from acquired meaning and assigned representation. Secondly, this particular drawing practice embodies the drawings' capacity to operate as a medium to reflect through.

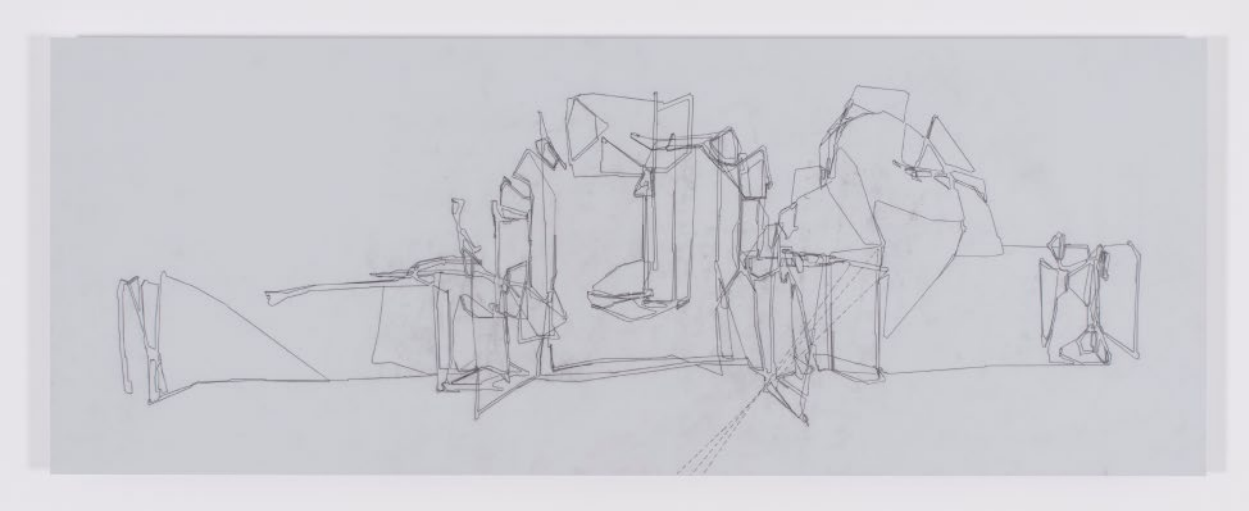

Fig 1 Drawing Out Gehry I, graphite and wax pencil on mylar, (part 1, 2017)

1. **Drawing as a reflection on spatial intend**; - The observation of a sketch

The sketch by Franck Gehry of the Goldwyn-Hollywood Library is made in 1983, three years before the completion of the building. Although this particular sketch drawing of Gehry stands present as a drawing in service of a building practice, one can detect a different background to this. The drawing is part of an intensely private drawing practice of Gehry never intended for public viewing.
The drawing demonstrates the sensuous line work that rejects traditional architectural draftsmanship in favour of what Gehry describes as a more 'open-ended' form of expression/ exploration. Gehry embraces drawing as a form of reflection, -a reflection that happens as his pen moves over the paper- his drawings have been associated with the unconscious, 'automatic' drawings of the surrealists. [1]

This sketch, a drawn section through the envisaged Hollywood library, seeks not to explore nor resolve the architectural detail at the resolution the building, rather, the sketch observes the architectural tectonics, principles and dynamics of what he conceives as the building and what he ultimately conceives as the architecture of the project.

The duality between seeing a sketch in service of a building practice in its representational role and drawing used as a tool for reflection is particular in Gehry's architecture practice. This latent duality is what interests me when I observe this drawing. He is not sketching out a particular problem or architectural detail, his sketch is much free-er than that, it seems to be searching for the architectural capacity of what is thought to become the building, it is searching for and exploring that what will make up the architecture of this building.

With this notion as a starting point I undertake a material dialogue with the sketch and I observe it. I observe the sketch by drawing it from different points of view. In this process of reiteration, I allow the embedded resolution of the drawing and its spatial depts to perform in a capacity that serves me and my search for an architectonic space.
The observation is drawn from drawing to drawing: every drawing is based on particular points of view of the previous drawing. These standpoints or iterations of the same object operate as entry points into the drawing. In this drawing process, there is a transfiguration that takes place from one drawing to another, from one point of view to another. The transfiguration of visual information from one state of the drawing to another is a process of mediation to be seen and sensed in the drawing resulting in the production of space. In this sense, although the drawings as outputs are autonomous in character and stand on their own, there are no premeditated or planned outcomes, the drawing process is in aide of understanding the investigation at hand: to interrogate this particular relationship to architecture and the nature of its architectural capacity.

When searching for the architectural capacity of my drawings, I like to lean on Hejduk and Eisenman's common ground in their reasoning on how to consider something as architecture. Although they strongly oppose each others standpoint, in their differences, they find a common ground that seems like a constructive way forward in probing the production of architecture within the drawing

Fig 2 Fig 2 Drawing Out Gehry I, graphite and wax pencil on mylar, (part 3, 2017)

2. Wherein resides the architecture? - J.Hejduk and Eisenman's common ground.

"I remember Dr. Eisenman coming to Berlin and seeing these two pieces in this great hall. They were 50 foot high ( ), they were giving off something. We talked about an aura. A thing like that. And he said to me: "That's not architecture, because you can't get int them." And I looked at him and said: "You cant't get in them." In other words, he was not in the position to get into them. You can only get into something if you understand or are willing to."[2]

Taking this statement of John Hejduk during an interview where he articulates the differences between his point of view and Eisenman's on what can qualify as architecture, as the starting point, there seems to be a common ground in the statement that one needs to be able to enter the construct to be able to verify if it is architecture. The difference in point of view sits in the expanded definition of how one can enter. For Eisenman, one needs to be able to physically enter a building. Hejduk on the other hand expands the definition of 'entering' as a form of understanding or willingness to understand.

Drawing does not have a fixed relationship with architecture, and seems to remain within the associative realm and on the exterior of spatial intent. In that sense, the drawing's relationship to architecture stays at arms length. As I am raising the issue, I nurture an understanding through this new set of drawings, Drawing Out Gehry (II). I'd like enter the drawing I am kept from at arms length and interrogate a relationship to architecture discourse to qualify the nature of their architectural capacity.

Eisenman conditions architecture with the qualifying experience of a physical entrance, while Hejduk speaks about the actuality or event of entering, which could exist outside a cartesian reality. I think here I have found an entry point to expand on my understanding of the drawings' proximity to architecture.

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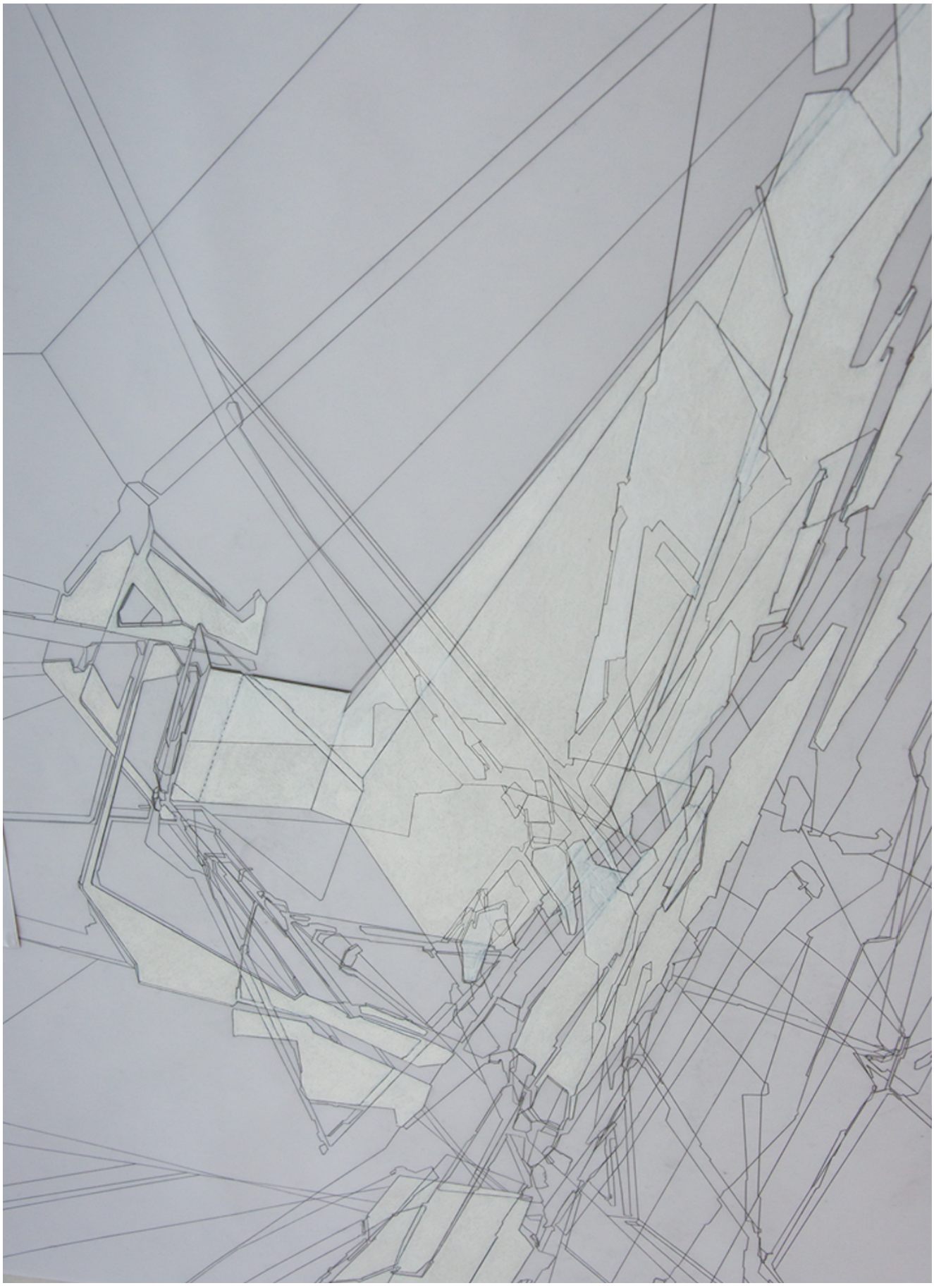

Fig 3 Drawing Out Gehry II, graphite and wax pencil on mylar, (detail, 2018)

ENTWINING BETWEEN POEM AND (CINEMATIC) IMAGE THROUGH ONEIRIC PLACES

SPACE-TIME SECTIONS BETWEEN TARKOVSKY'S 'MIRROR' AND THE PARENTAL HOME

VIKTORIJA BOGDANOVA AND
TADEJA ZUPANCIC

Entwining Between Poem and (Cinematic) Image Through Oneiric Places
Space-Time Sections Between Tarkovsky's *Mirror*[1] and the Parental Home

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Abstract

'If you live in a house - the house will not fall.'
Arseny Tarkovsky, qtd. in *Mirror (1975)*

Observing spatial reality through the eyes of a child brings freshness in the way of perception, a revelation in each new look at the same object. Therefore, the embodied memory of the parental home represents a tangible palimpsest of inner mirrors of the self, an unexplored archive-laboratory of incorporated spatial patterns. Rooms, objects, neighborhoods, receive importance according to their relation to our beloved ones. In other words, the (personalized) built reality can be measured as a somatic diary – a collector of shared memories.

The paper (and the creative work) exhibits decomposition of the (inner-outer) spaces of the protagonist's childhood in Tarkovsky's 'Mirror', and a parallel examination (analysis and reordered synthesis) of the author's personal memories of the parental home. The tools of investigation are *poem-drawings* and *models*, as processual modes of excavating inner spatial memories, and of personalized interpreting of Tarkovsky's oneiric places. The elaboration of spaces follows the route(s) of the *living center prototype* as a guiding thread: Tarkovsky's mother, author's grandmother.

There are few expectations of this paper/exhibition. First, it is expected that it will reveal ways how poem-image entwinement can lead to a semantic replenishment, how can it intensify a synesthetic expression by the author, and a more holistic perception by the observer. Second, the comparison between the two parallel examinations is expected to exhibit repeatability in some spatial appearances, as well as variability in their layeredness (person-specific, site-specific, medium-specific). Third, the research through the self is expected to examine how the meaning of architectural space can be *re-created* through its relation to the beloved prototype, how the 'language' can be transformed, how 'trivial things' can evolve into a 'water, solid, stratified', both flowing through and building our most personal spatial memories (Tarkovsky, 1975).

Finally, the paper aims to disclose ways how deeply personal spaces can evolve into patterns of design-approach; how recognizing and re-creating fragments of their constitution in others (self similar) exteriors keep this inner home of memories from falling.

Keywords: Tarkovsky, poem-(cinematic)image, poem-drawing, parental home, embodied memory

1. Evoking childhood memories: emotive re-inhabiting of oneric spaces
Through the senses of a child, perception and interpretation of external reality are always imaginative processes. Through them, deeper (personal) connotations of the perceived objects are being developed into authentic narrative: an appropriated explanation of what is observed. Free from preconceptions, the child acknowledges the environment through curiosity and desire for 'conquering' (embodied re-reading) of surrounding spaces. Living through a psychophysical scale different than the one of an adult, he/she settles thoroughly the micro spaces of the home. Through his/her movement and attitude towards the places of growth, his/her innerness[2] becomes readable to some extent.

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[1] *Mirror / Зеркало*. 1975. Directed by Andrey Tarkovsky, Soviet Union.
[2] the 'irreducible', 'hidden and uncognizable character', whose manifestation can be revealed 'only when the dynamism of the human subject is performed' (Mara, 2007:87)

Furthermore, childhood memories dwell on a border covered with mist: between real and imagined, between what's heard and what's personally acknowledged, between the dream and the true experience. As phenomena difficult to be understood, they emerge in the consciousness in unpredictable moments during a person's life, especially in moments of fragility (illness or death of a close person, psychological crisis, disappointment, unbearable joy). Such recalls are often emotionally poignant because: 1. they are deeply personal and related to a beloved-(shared)-place and beloved-personality-prototype; 2. their mysterious and unforeseeable appearance stimulates revisiting the past, re-imagining the future, and re-thinking their relation through the personal present. Thus, turbid embodied memories can lead to an emotive re-inhabiting of spaces lived, ruined, transformed, or desired/imagined: their reflection flows through our present environment, as well as through our constructed vision of ideal dwelling.

A revived memory of some space from the paternal home can generate anxiety: an interruption of the everyday flow of lived experience by an 'intrusion' of an event coming from a different place/time/reality than the current one. Because a memory is 'a spiritual phenomenon' whose absence can transform a person into a 'prisoner of unrealistic existence' (Tarkovsky, 1999:56), the reflective re-inhabitation of that memory brings emotional burden, due to its strong but unclear significance. According to Boym, expert in Slavic and Comparative Literature at Harvard University, nostalgia (a portmanteau of nostos-*return home* and algos-*longing*) 'appears to be a longing for a place but is actually a yearning for a different time-the time of our childhood, the slower rhythms of our dreams (…) against the time of history and progress' (Boym, 2001:8). Thus, a memory or a dream is a 'different time' and a personalized vision of an ideal home - a reflection of memory from the earliest childhood environment. The memory of different time is a resistance towards the belief that History and Revolution are *time*: on the contrary, 'both are consequences of time, while time itself is a state, a condition', a deeply personally experienced truth (Tarkovsky, 1999:56). Analogously, the gaining of courage to reflect on a childhood memory, as spiritual and meaningful phenomena, means 'overcoming one's own boundaries' (Man, qtd. in Tarkovsky, 1999:102), sacrificing the stable ground in the name of a tireless re-creation of one's own *experienced* truth.

In her master thesis titled *Tarkovsky-Inspiration in Architectural Design*, Perič introduces Foucault's concept of *heterotopia* as closest metaphor to define the spatial layers of all Tarkovsky's movies. Such spaces are 'part of the real space but are completely different that the space they reflect or refer upon: the point of break between these two kinds of space is a place of mixed experiences from the two, and has a role similar to a *mirror'* (2017:46). Memories, dreams, hallucinations, the mist of life (Unamuno, 1914) with all their architectural/ environmental backgrounds enter this point of experiential break. Two of Foucault's heterotopia types relate directly to memory:

1. type one: crisis heterotopia – privileged places, planned only for persons that belong to a specific, vulnerable condition, or in a creative-process-condition. In such places and periods of time, a childhood memory is crucial in preventing the negative outcome of the crisis. According to Dostoyevsky, even one memory is the person's healthiest and highest possession, especially if it is 'carried inside from childhood, from the parental house' (1968:567). Places which contain events from our memory become crucial in re-thinking of reality through art – in the form of literature, movie, architecture etc. These places gain meaning according to their relation to our beloved ones and at the same time, the beloved prototypes (Mother, Grandmother, Father) manifest themselves as places of our own reflection: fragmented mirrors of our innerness.
2. type four: heterotopia of time; according to Perič, *Mirror* is a movie created as 'an inner ceasing of (real) time and as a re-cognition of the personal time'. He himself - a museum of his own memories, dreams and wishes – Tarkovsky succeeds to express through cinematic language the 'personal archives of the main character' (2017:49). This occurs as an empathic defamiliarization through evocation of memories, through revealing the unknown/forgotten in what is considered familiar.

Mirror exhibits the flow of Andrey's memories/fears/desires through his own trans-temporal reality. 'Understanding' his suffering/joy is possible only through unconditional compassion with each character on highly sensitive emotional level. The inner touch with the movie occurs forthrightly because his approach of directing brings you *vulnerably close* to life itself, to your life, and makes you feel intensely present in co-

experiencing his apprehension. This paper and the creative work elaborate a subjective commiseration and identification with this person, through exhibiting contemplations about: 1. the four examples of overlapping between the poetry by Andrey's father and the environmental background of the frame in *Mirror*, through the movements of his mother-as a strongly present donor of connotations; 2. author's personal notes (poem-drawings) about the paternal home, decomposed on trans-temporal embodied memories through the movements of the grandmother-as routes that bring together the other beloved prototypes.

2. Emotives: poem-cinematic image entwinement as trans-temporal reminiscence

Events happening in Tarkovsky's movies speak directly to observer's emotions; the intellectual preparedness has a secondary role each time we watch them. *Mirror* is perhaps his most authentic artwork, and yet: besides the awareness that it reveals a deeply personal truth, as observers we can feel that the screen, in a mysterious way, exhibits part of our own most vulnerable memories. Tarkovsky's cultivated sincerity awakens rationally unexplainable emotions during the observer's compassion with the characters on vague levels.

For example, in the last scene of *Mirror*, the Father asks the Mother a rhetorical question: 'Would you rather have a boy or a girl?'? The camera grasps the facial expressions as manifest of the emotion that this question awakens in the Mother. The camera moves to the Mother in older age (Maria Vishnyakova), leading the little Andrey and his sister through the fields around the house, passing by architectural remnants: ruined well filled with rusted pots, rotten logs-remains of the house-walls. The camera turns back to the young mother (Margarita Terehkova) and the rhetorical question, showing her limit condition, with tears and convulsion in the muscles around the eyes – an immense-almost violent-living joy, generating fear of its intensity. As an observer, you can feel your own tears, and a degree of identification with her 'blessed suffering'; in each cell you feel a lament for time-places which happened in the past or did not happen at all. In each cell you can feel a passage of memories of all your personal beloved prototypes reflected in her condition. It hurts to discover that you know 'only how to demand' and that you are incapable to express your love for the closest family (words of Andrey's wife, acted by Terehkova). And yet, even as observer, you feel incomprehensible purification, relief. A crucial catalyst in this esoteric condition is the beginning of Bach's 'St. John's Passion' (1724), heard the final scene in an unobtrusive way (we've noticed this during the second time of watching). The strength of such touching displacement does not loose its intensity even after the eight re-reading; as if it has a silent strength of resurrecting wonderment, through simple and purified exhibiting of a unique emotion.

Such crucifixion of the innerness in an art form requires the same intensity of chest-opening by the observer. Tarkovsky himself emphasizes that the movie 'should be experienced as one's own life, and should be accepted deeply personally, as private experience imprinted in the time of the movie screen', and that a relation between the cinematically observed and the personally lived should be established. He develops a theory based on director's responsibility in cultivating the sensitivity of the audience to perceive the movie as an artwork. He criticizes Eisenstein as a creator who 'transform thought into despot' and who 'prevents the individual to relate to the movie', and by this-prevents the process of individuation necessary for re-creation of an authentic worldview. Tarkovsky stood against inserting 'lectures and propaganda speeches' in the movie production, and as the utmost important cinematic units he introduces 'the deeply inner, essential experiences' (for both the author and the audience). In absence of intellectual patterns (critique of formalist's 'poetic' film of that period), the artwork concentrates on its *emotive* role: this makes possible for the audience 'to behave in the light of individual experience' (1999:181). With such vision about the true way in film art, Tarkovsky creates movies which 'transform and stir up the human soul, while making it receptive for the Good': you feel 'disarmed and enthralled' from the very beginning, because of the 'versality' and 'indeterminacy' of the cinematic image (163).

We believe that the poems written by the father, Arseny Tarkovsky, superimposed on few scenes have enormous role in the multiplication of this versality and indeterminacy of cinematic experience. His own voice appears through recitation of four poems, overlapping with the events on the cinematic image related to fragments of the living environment from Andrej's childhood: the maternal house, the surrounding

fields/river/forest, the working place of the Mother, the snowy landscape for military exercises with his orphan friend, and the documentary-sequence: crossing of the river by group of soldiers during the war.

Scenes are developed in different times. In three of them appears the Mother, seen through the eyes of the Father and the Son. Arseny's poetry becomes a mirror of reality, a poetic extension of the visible through individuation – emotive immersion in and re-creation of the tie with the observed/appropriated subject-object. While experiencing these scenes, one can feel the presence of unconscious measuring of the inside-outside of the home, through the scale of the little Andrey, and through its relation to the beloved prototype.

Although fragile and ambiguous, the poems represent specific columns that mysteriously connect all the pieces of the movie. Besides the fact that they appear at only four scenes of the movie, their echo in each of the other (previous and following) scenes is omnipresent. The first poem starts from the yard, then flows inside the maternal house and and closes the sequence with Mother's portrait. The second poem happens in a hall in the factory-the Mother's workplace, shown as contrast to the nature of the Home. The third poem begins during the military march over the river and ends into an individualized perception of war – a stagnant and disoriented movement in a snowy landscape of an orphan child. The fourth poem begins on a road towards the Home and ends as a sequence of childhood memory/dream. All four environments are mutually defined. Both recognition of and comparison with the embodied memory of the first home occurs: it is a way to protect the inner home from falling. As in Calvino's stories: when Kublai Khan asks Marco Polo why is it that he has spoken so abundantly about all the cities from the kingdom, and yet- has never spoken a word about Venice, he says: 'What else do you believe I've been talking to you about? (…) To distinguish other cities' qualities, I must speak of the first city that remains imlicit' (Calvino, 1972:86). The Home, built into our body is like a water – structured through the places of childhood. Marco Polo expresses fear that even through indirect speaking about Venice-he will lose it. Analogously, *Mirror* is a brave speech, overcoming the fear to express what is inexpressible-cultivating sincerity in examination of the most vulnerable memories.

Figure 1. Resemblance between the inner archives of the observer and the director[3]

2a. **First Dates**

Belonging only to me,
You woke and at once transformed
The language humans speak and think.
Speech rushed up sonorously formed,
With the word "you" so much reformed
As to evolve a new sense meaning king.

And suddenly all changed, like in a trance,
Even trivial things, so often used and tried,
When standing 'tween us, guarding us,
Was water, solid, stratified.

Arseny Tarkovsky, qtd. in Mirror, 1975(fragment)

[3] Figure 1a.) The author and her grandmother: integration through mutual dwelling on window, photography, Bogdanov, N., Veles, 1991; 1b.) Vishnyakova's portrait and Aleksey (acting Andrey) integration through Pushkin's letter, excerpt from *Mirror*, 1975; 1c.) Smile after playing a game, author's grandmother, photography, N. Bogdanov, Thasos, 1999; 1d.) The cry with a smile from the final scene, Terehkova (acting Andrey's mother), excerpt from *Mirror*, 1975.

Figure 2. Scenes during the recitation of the first poem. The maternal house.

The scene elaborates the room-apparently both a bedroom, dinning and reading room-through the moods of an abandoned Mother with two children. At the beginning, there is a frame showing the exterior and the yard, and later-a frame showing the exterior viewed from the inside, through the window. The recitation time frame follows the scene on the wooden fence (the dialogue between the Mother and the Doctor) and precedes the the scene with the fire in the neighborhood-showing a mirror image of the two children gazing outside. *First Dates* resounds through each scene, as a testimony of the blooming period of love between the two parents, visible most intensively at the ending scene of the movie. There is no linear time-space narrative in *Mirror*, and yet, a holistic experience of the scenes comes to us as an organically exhibited truth, giving a silent resistance to a logical/usual flow of events. As an introductory poem, *First Dates* announces the transformed meaning of 'objects standing between us, guarding us' (the lovers): each object in and outside the room gains meaning according to its relation to the loving dialogue.

In a similar way, objects in author's paternal home gain importance according to the development of the loving dialogue of a different kind: the one between a granddaughter and grandmother in times of trouble. For example, the wall between the living room and grandmother's bedroom had different connotations in different periods. In 1996-it was a vertical surface, serving grandfather to keep him from falling during the first moments of vertigo attacks, giving us time to react and help his approach to the bed. From 2010 to 2017-it became a field of communication between two beds (author's and her grandmother's), a transmitter of signals-different types of knocking as signalization of a cheerful play, or as an emergent call for help due to her pains. Over time, by modifying the space-appropriation, we were changing its semantic valency.

2b. **I waited for you yesterday since morning**,
They guessed you wouldn't come,
(…)
No word of comfort, tears undried…
Arseny Tarkovsky, qtd. in Mirror, 1975 (fragment)

The poet speaks in the name of the Mother, in feminine. Here, we can read the condition of waiting as time in which pain and fear of the absence of the beloved prototype are being formed. The architectural configuration of the printing factory is shown as an opposition to the Home: instead of icons or family portraits we see Stalin's and Trotsky's posters; instead of windows opened towards the forest, we see parapets inhabited by interior plants. It is interesting to note how Tarkovsky develops the scene where the Mother chooses the parapet as a place to perform her professional duty, in contrast to the atmosphere around her: repeatability of typing machines and typists, turning their backs to the window light. Her posture is set in the foreground: before the branches of the room plant.

Figure 3. Scenes before and during the recitation of the second poem. The printing house.

In a similar manner, I felt jealousy towards each place that kept me away from her. I felt incomprehensible fear even from my own Home during her absence. City's bridges, market, stores, sidewalks, gained the mark of my protagonist or antagonist according to how close or how far they kept me from her presence.

2c. Life, Life! *Arseny Tarkovsky, qtd. in Mirror, 1975 (fragment)*

Neither death, nor darkness, exists.
We're all already on the seashore;
I'm one of those who'll be hauling in the nets
When a shoal of immortality swims by.
If you live in a house - the house will not fall.

(…)
I measured time with geodetic chains
And marched across it,
as though it were the Urals.

Yet for a corner whose warmth I could rely on
I'd willingly have given all my life,
Whenever her flying needle
Tugged me, like a thread, around the globe.

Tarkovsky says that though this scene he is trying to elevate the significance of *Mirror* above his personal biography-to touch questions addressing the collective wounds of Russian people, which he felt during the war. Here, we can read the nostalgia as a 'relationship between personal and collective memory (Boym, 2001:9) The poem speaks about immortality, while recitation itself integrates two events: crossing of the river by soldiers and a sorrowful movement of a child (whose lost his parents during the war) through the snow.

Figure 4. Scenes during the recitation of the third poem. The war.

Bringing together these two versions of war relativizes what was then considered as progress. These two precede the scene of the reunion of the father with the two children – one of the most touching moments. Here we can read a personal experience of war through the absence of the father, through the painful compassion with the abandoned mother. Tarkovsky names the documentary-scene as 'center, essence, heart and nerve' of the movie which begun as his 'intimate lyrical memories'. He explains that the scene is a brutal story about tragic 'suffering as a price of what is known to be historical progress, and about the countless victims-forgotten in the later period (…) For a moment it was impossible to believe that such suffering was meaningless' (Tarkovsky, 1999:128). In the previous entinement of poem and cinematic image we can read the pain caused by mother's absence; in the second-the pain caused by father's absence.

2d. **Euridyce.** *Arseny Tarkovsky, qtd. in Mirror, 1975(fragment)*

Without body a soul's nude,
as a body's nude without a shirt:
no thought's forthcoming, no good,
no idea's born and no word.

A question that has no answer:
whoever can come back
from the floor where no dancer
was ever to leave track?

In the fourth poem, we read the tracks of the dancer as metaphor of memories we imprint inside our embodied 'floor'. In this scene the whole spatial configuration of the house becomes clear. The entwinement between the poem and the image seems as continuation (and intuitive resolution) of *First Dates* entwinement. The dream sequence in black and white when the little Andrey (Aleksej) enters the house is emphasized through the words: 'run on my child, do not lament the fate of poor Euridyce'. These lines are *mirror* of Arseny's farewell poem, dedicated to Andrey (he was at the age of three) before leaving his family: 'Enter your night dreams in yourself/and reflect in your own mirror' (qtd. in Zelenskaya, 2016). Digging in his most vulnerable memories, Andrey succeeds to fulfill this covenant: the opening scene of the movie (séance when the young man overcomes speech impediments) can be understood as preface that *Mirror* is the language through which he can express heavy emotions 'without speech impairments' (Abraham, 2013). As Tarkovsky writes, identifying what is true with what is expressed, 'to discover someone's personal truth (since there is no other, collective truth) means to search for a personal language, a system of expression constructed to give shape of one's ideas' (Tarkovsky, 1999:84). It is a never-ending process: as Jung's individuation concept.

Figure 5: Scenes during the recitation of the fourth poem. The Home

3. Processual diaries as testimonials of the creative process

Figure 6: Resemblance between the future Home and the childhood housing prototypes[4]

[4] 6a.) Excerpt from the Diaries (Tarkovsky, 1994:64); 6b.)-the maternal house and 6c.)-Andrey's apartment are excerpts from *Mirror*, 1975; 6d.) Photography of the future Home, tree, wife and dog (Aldredge, 2013)

The first fragment of Figure 6 is a scan of Tarkovsky's processual notes-diaries during the making of *Mirror*. It is written/drawn in 1973. The drawing represents a house-a Russian dacha, embraced by a body of text. It is drawn together with a tree in the front as clarification of the context. Bellow, few fragments are drawn: a window with shatters, a stone, a leaf, a wooden door, a mushroom. Although the text is difficult to read, we can easily recognize that the drawing is intensively present through the scenes of *Mirror*: the porch in front of the house in Yurivetsky District, and the openings with vaults in the apartment of his own's apartment.

We were astonished when we discovered a translation of the handwriting: 'If I succeed in making The Bright Day then I must do a treatment for the film, or at least the screenplay, about Dostoievsky. It's high time (…) What is the most beautiful tree? It must be the elm. Only it takes so long to grow. Which grows faster? A white willow or a silver poplar? Silver poplars are beautiful trees.' (Tarkovsky, 1994:67). At first sight, his thoughts about *The Bright Day* and his thoughts about the trees do not have any connection, especially if the reader is convinced that the house from the drawing is the one from Yurivetsky District. By re-reading the *Diaries* and through a dialogue with experienced researches (Taisia Mikulovich) we've learnt that the drawing represents the future home Tarkovsky bought in Myasnoye on 24th April 1970. In his notes from 1970 to 1973 he mentions the house as being in a constant process of renovation. During the condition of uncertainty about the final realization of Mirror (initially titled as *The Bright Day*), he was thinking about planting trees in front of the new Home. The spatial patterns from the maternal house are manifested not only in the architecture in *Mirror* (the house is rebuilt, and the white flowers are re-planted), but also in the inner desire for the future home. This future home is a creational reflection of the maternal home, which appears also in his other movies: Nostalgia (1983, built inside a ruined renaissance basilica) and Sacrifice (1986, modified according to the Swedish architectural specificity).

There is another testimony in the diaries related to the poetic image that takes roots from the maternal home. Ond 2nd and 3th July 1973, Andrey writes his few and only (as far as it is known) personal poems:

No sound of movement, no knocking
No floor boards sing in the hall,
The dull desperation of parting
Looked us in the eyes.

Nobody now believes
My worthless prophecies
Just now in the empty house
The doors were gently closed.
(1994:75)

A sigh of absence can be felt, an empty home, an architecture emptied of any events. Then, he describes a farewell with the birthplace with a vague lament for the place or the beloved subject:

What cannot be said in a word
Will not be explained by pretense
Nor describe the way I'm in love.
I'll help with a wonder-working saint
On the well-trodden path through the ploughed fields. (76)

According to the notes before and after these lines, it cannot be concluded to which person the poem is dedicated and which ones are the places of lament. But they contain the echo (mirror reflection) of his father's poems, and-inevitably-the sorrow for the maternal home, the nostalgia-not only for the home as a place, but also as a lack of a corner with warmth one could rely on (Arseny Tarkovsky, qtd. in *Mirror*, 1975).

The desire to immerse in reading the personal mirrors-in the family and in the common places-is a difficult commitment and a critical process of internalization. Tarkovsky succeeds to express this through his cinematic language. While thinking if it is better to meet his father or to write him a letter, he writes in his Diaries: 'it is far easier for me to relate to total strangers' (1994:20). This condition of impossible dialogue, he names as 'Dostoyevskism or Dolgorukysm': 'we all love each other and are shy, afraid of one another' (19-20). Such anxiety is can also be felt in *Mirror*, in the telephone scene. The camera moves through Andrey's apartment, showing his mother's portrait in the bedroom and his father's portrait near the working table, and all objects that resemble their presence. In one moment of the conversation, he asks 'mom, why do we have to fight all the time?' and asks forgiveness if he had made a mistake. Instead of an answer – a dropping of the handset is being heard. The scene ends with close up of the curtain before the window.

The relations with our beloved ones are settled with dense and various kinds of emotions, so it is indeed much easier for us to develop ties with strangers. This was the first thought that appeared in me after the first watching of *Mirror*, without any previous reading of *Sculpting* or the *Diaries*. The actors express an intensive compassion with the real characters, so you have the impression they express your own emotions. Few months later, I've read about the creative process between Tarkovsky and the actors, especially Terehkova: in the scene on the wooden fence, she acts without knowing the development/future narrative of the story, so she is in 'a psychological condition in which it is impossible to pretend' (1999:136), a condition which is 'strange even for herself, so she can perform naturally, true to her own emotion and intellectual nature, in a shape which is correct only for her - an original, unique expressiveness' (139). As an observer, you are experiencing a of co-widening and co-defining of reality through your personal experience, contextualization of the exhibited emotion. This made me think of my childhood spaces and note spatial memories through poem-drawings. I was surprised to discover to what degree the attempts to express my feelings through this composite language have resurrected layers of memory. A common feature for each poem-drawing is that it is always related to place and is always related to a beloved person-I do not have spaceless of lonely memories.

Then, I started to write a fragmented story about my birthplace, narrated through the relation to the beloved prototype (grandmother). Although the process, so far, has been emotionally exhausting (a cross-section of the Home), somehow it brought a relief - a part of the inexpressible love was being expressed: feelings about the closest ones, as a 'constant pity towards them because of my insufficiency, my feeling of duty which remains unfulfilled', and unspoken (131). An intuitive discovery during this creative process (inspired by *Mirror)*: the transformation of the Home through poem-drawing-to a great extent-represents a language of expressing my most important questions – they appear through appropriated objects, walls, windows, curtains, carpets, series of perennial plants, instead of words or gestures. The constant re-creation of the home becomes mediator between my innerness and the expression of the most vulnerable ties; it stores/exposes emotions- 'memories, dreams, conscience, nostalgia, self-reflection, freedom, family, faith', (Perič, 2017:53) and becomes an emotive encyclopedia of the (wider) family. The home/house/city evolve into common language that archives inhabitant's unspoken feelings: an intimate diary whose attentive re-reading by the observer can create inner distortions, leading to an intensified individuation.

Thus, according to my emotive immersion through poem-drawings: 'while me and brother were measuring corners with our bodies/Through jumps, stars and lows/ She remained invisible/Until she hears our cry/Of joy-dissolved.' During the years, 'The wall transformed/In a paper/For blueish write-offs'. Its 'trembling/ Spoke her pain/Fear/And smile'. The kitchen window has grown into a micro-place of upbringing: 'With my back leaning on her palms, /Trembling as a snowflake/Impossible to be protected/From inherent fragility/ And tearfulness.' The solar curtain falling on her face seems to spring from my presence in her eyes. The dinning table appears as place of creation of the 'First map of Otherness', a children's hut, darkened with long blankets, lightened by 'A matchstick of fire in brother's palm/A piece of strudel/A decomposed toy.' Our separate windows are intertwined with a piano-cry. The sky inside the window is double-sided: the allien beauty of the street and the city, and her hand-holding me from falling into them.

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Figure 7. Author's poem—drawings (fragment)

EMBODIED CONCEPTS OF DRAWING AND WRITING

CHARLOTTE ERCKRATH

ABSTRACT

Embodied Concepts of Drawing and Writing

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This research project aims to investigate the potential of ambiguity as an underlying principle in the construction of an immersive and implicating architecture. If ambiguity emerges in the interference of precisely articulated concepts as is discussed by Ana Maria Rabe in her discussion on Eigengesetzlichkeit (being-coherent to its own sets of rules) in the essay on the space in Las Meninas and Umberto Eco's idea of openness from his essay The Open Work, it holds within it the apparent ability to construct situations of engagement in an architectural space through an unveiling of an inherent logic. More precisely ambiguity may be located in the moment of oscillation between definition and openness at the interference of one system with another.

To explore this relation in spatial terms the research is departing from a comparative approach to pictorial space and it's notation through the rules of descriptive geometry under the focus of the construction of an enhanced spatiality through increased spatial depth or flatness. The target is to develop knowledge on these terms beyond their linear measurability towards an understanding of their experiential quality in the practice of drawing.

This research will make use of methodologies from the field of surveying that employ the bodily and visual horizon in the process of constructing cartographic information, which share as their basis the same optical rules as perspective geometry and are strongly affiliated with a Cartesian concept of space. The knowledge that promises to be enriching for architectural discussion is of embodiment and the consequential inhabitation of the drawing process, which potentially resides in the application of the measuring instruments, surveying techniques and drawing tools.

This project resides strongly in the field of architecture research, which is largely concerned with embodied experience but at the same time misses emphasis on the critical tools to encourage spatial embodiment in the design process. Through my practice I am attempting to develop new tactics for architectural design and review the relationship of drawing and spatial embodiment through ambiguity.

Keywords: ambiguity; Eigengesetzlichkeit; open work; writing; drawing; embodiment

The drawing research departs from Helmut Newton's photograph *Selfportrait with Wife and Models*, which shows a space of a certain complexity and strangeness. Therefore the image offers itself to this inquiry. With it's strong references to *Las Meninas*, what Ana Maria Rabe writes about *Velazquez'* painting may also be true for the Newton photograph: *With its numerous layers of meaning, (...) its relations and contradiction, the staging and the blind spots, the ambivalences and constant inversions*, the image is putting the viewer into an open but in itself simultaneously coherent dynamic space. The conflicts that arise between the openness of the work and its coherent sets of rules result in a principally infinite possibility of interpretations.[1]
The subject of the photograph is the network of gazes entangled in the mirror reflection and in the spatial arrangement.[2] In this study I speculate on the ambiguity of spatial depth in the image through a reverse perspective: reconstructing the visible elements in parallel projection. The perception of depth is strongly related to perspective and even though not all of its aspects can be discussed through perspective analysis, for some aspects this will prove to reveal valuable aspects. The perspective investigation is also the first step towards building a scenario for further research on the potential of photogrammetry and spatial journey to inquire into ambiguity. The process of constructing the reverse perspective has been a simultaneous reading and rewriting the image with the aim to get behind some of the spatial arrangement, which Newton has composed to achieve an uncertainty of spatial depth.
An ambiguity, proposes William Empson in his *Seven Types of Ambiguity* (1930), is *in an extended sense, [...] any verbal nuance, however slight, which gives room for alternative reactions to the same piece of language*.[3] Even though Empson's work on ambiguity refers to poetical writing, some of his findings hold potential for a transferal into a spatial discourse.

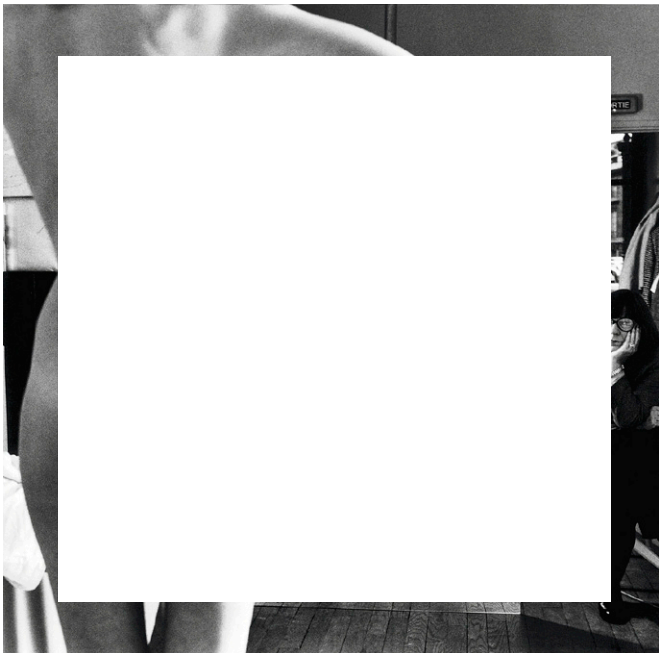


Figure 1:
Helmut Newton *Self-Portrait with Wife and Models,* 'Vogue' Studios, Paris, 1980, gelatin silver print (118.1 x 121cm.) © Helmut Newton Estate / Maconochie Photography
permssion requested

An important discovery is that ambiguity in its nature dissolves in the attempt of an analytical description. If one takes apart all possible meanings of a statement the forces that are set up within it cannot be held. The unity of an ambiguous work is therefore crucial for ambiguity to be effective.

1 Ana Maria Rabe, *Das Netz der Welt - Ein philosophischer Essay zum Raum in Las Meninas*, (München: Wilhelm Fink Verlag, 2008)
2 However the gaze of the photographer, voyeur, and spectator at the scene with the nude bodies will not be the focus of the present investigation. I have discussed these relations in my thesis *Subjectivity and Objects in Helmut Newton's Selfportrait with Wife and Models*.

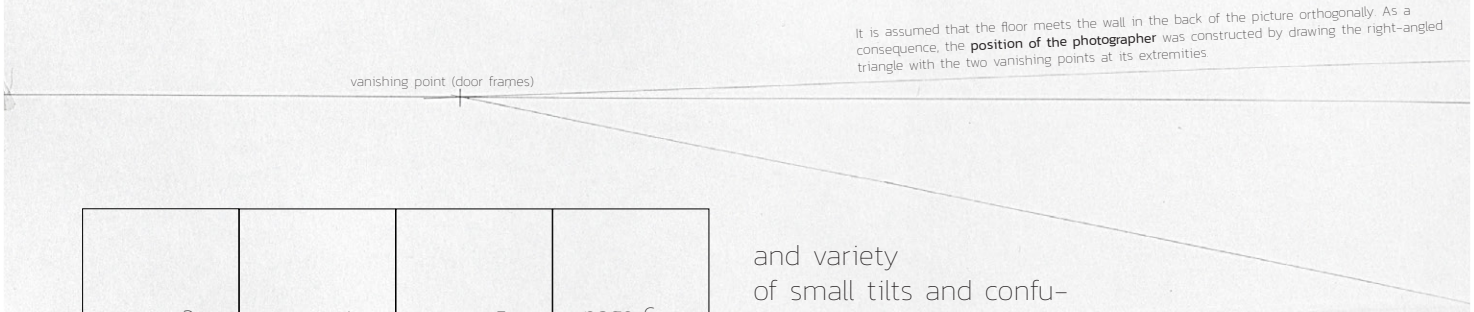
3 William Empson, *Seven Types of Ambiguity*; (London: Chatto and Windus, 1949) p.1

In complicated situations this conflict threatens the unity: you are thinking of several things, or one thing as it is shown by several things, or one thing in several ways. A sort of unity may be given by the knowledge of a scheme on which all things occur; so that the scheme becomes the one thing, which is being considered. More generally one may say that if ambiguity is to be unitary there must be 'forces' holding its elements together.
(...) Many forces are covertly included within ideas; and so of the two elements, each of which defines the other, it is much easier to find words for the ideas than for the forces.[4]

He states that the forces *cannot be discussed in terms of ambiguity because they are complementary to it.*

But by discussing ambiguity a great deal may be made clear about them. In particular, if there is contradiction, it must imply tension; (...) in some way other then by the contradiction, the tension must be conveyed, and must be sustained.
An ambiguity is not a device on its own. It must (...) arise from and be justified by the peculiar requirements of the situation. [5]

The space in the photograph apparently sets up a system of nuanced meanings, but as Umberto Eco suggests, *the 'possibilities' which the work's openess makes available always work within a given 'field of relations'.*[6]
The aim of this drawing project is therefor not the measuring out of the scene of the photograph but to explore the relationships – more specifically the spatial relationships of scale and depth within it. This careful observation of the forces that play out the spatiality and experience of depth in the picture is the focus of this work.
A preliminary conclusion may lie in the interaction of a number of subtle irritations that are reveiled in the reverse perspective reading of the image. The complexity



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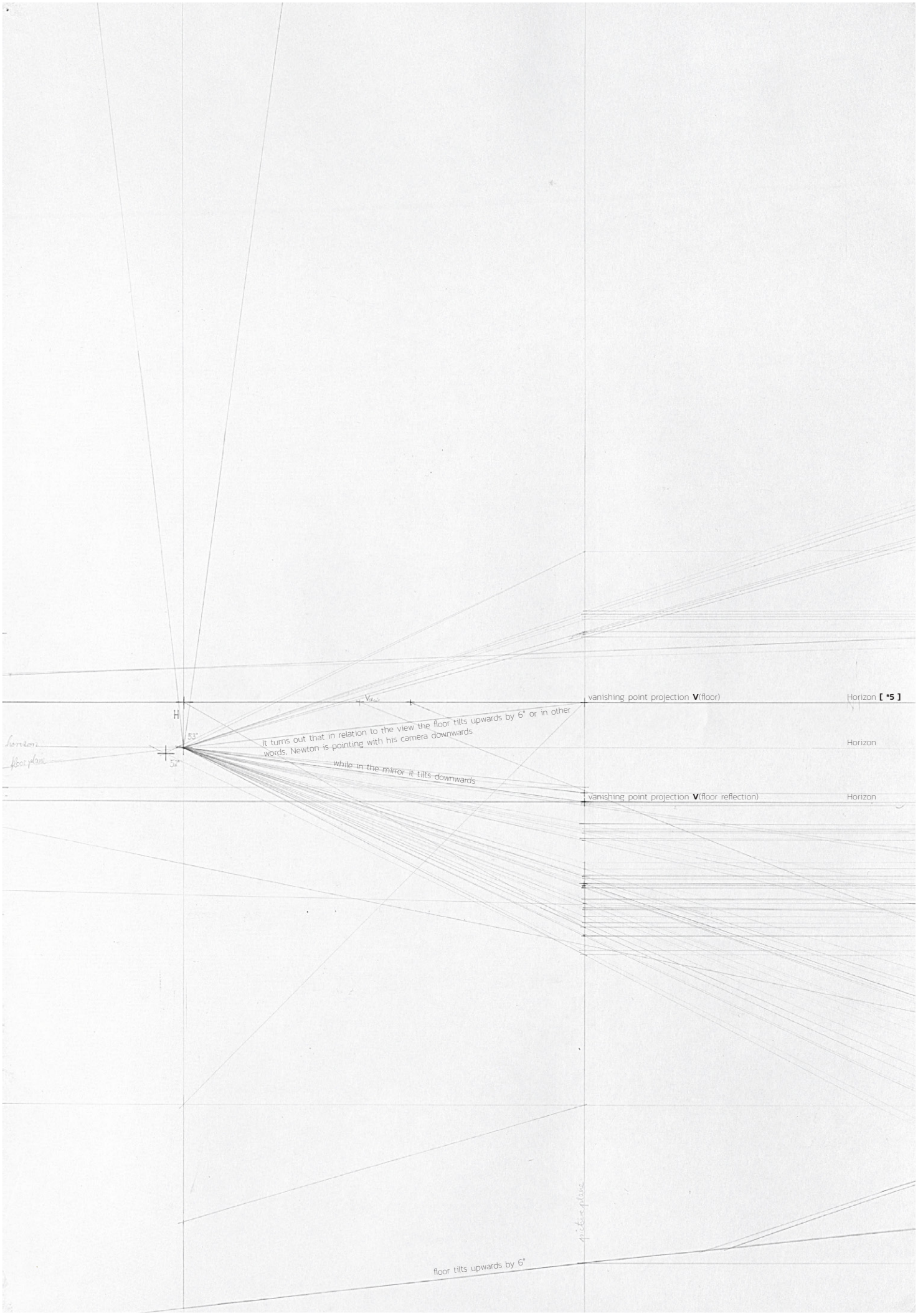
and variety
of small tilts and confu-
sions are just enough to engage a variety
of spatial experiences without questioning the unity of the single spatial situation.

Figure 2 (p.3–9): Drawing by the author
Drawing out Helmut Newton's 'Self-Portrait with Wife and Models, 'Vogue' Studios, Paris, 1980'

4 Ibid p.234 ff

5 Ibid p.235
6 Umberto Eco, *The Open Work*, (Cambrigde, Massachusetts: Harvard University Press, 1989) p.19


vanishing point projection **V**(floor)
Horizon **[*5]**
H
53°
It turns out that in relation to the view the floor tilts upwards by 6° or in other words. Newton is pointing with his camera downwards
Horizon
while in the mirror it tilts downwards
vanishing point projection **V**(floor reflection)
Horizon
floor tilts upwards by 6°

parallel sides of the mirror

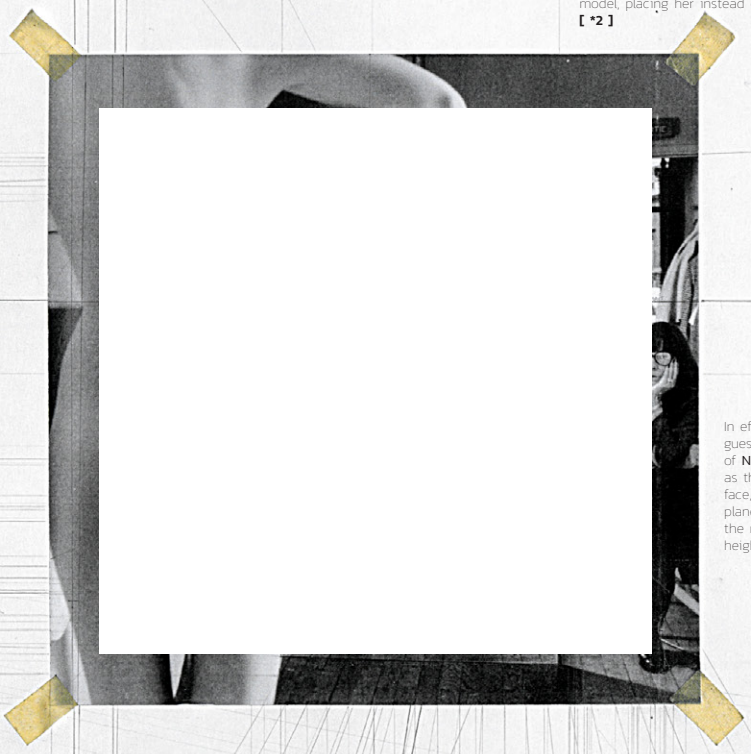
parallel sides of the mirror

Still, my drawing suggests a height of about 175 m

mirror **[*1]**

Because the sides of the **mirror** are parallel to the edge of the image, they are vertical in relation to the view.

The bottom and top edge behave differently. Seemingly, the left side is further away. The mirror is turned away from the straight view and tilted towards the model, placing her instead of the photographer into the center of the reflection.
[*2]



vanishing point above the **camera's horizon**

focal point F (camera's horizon)

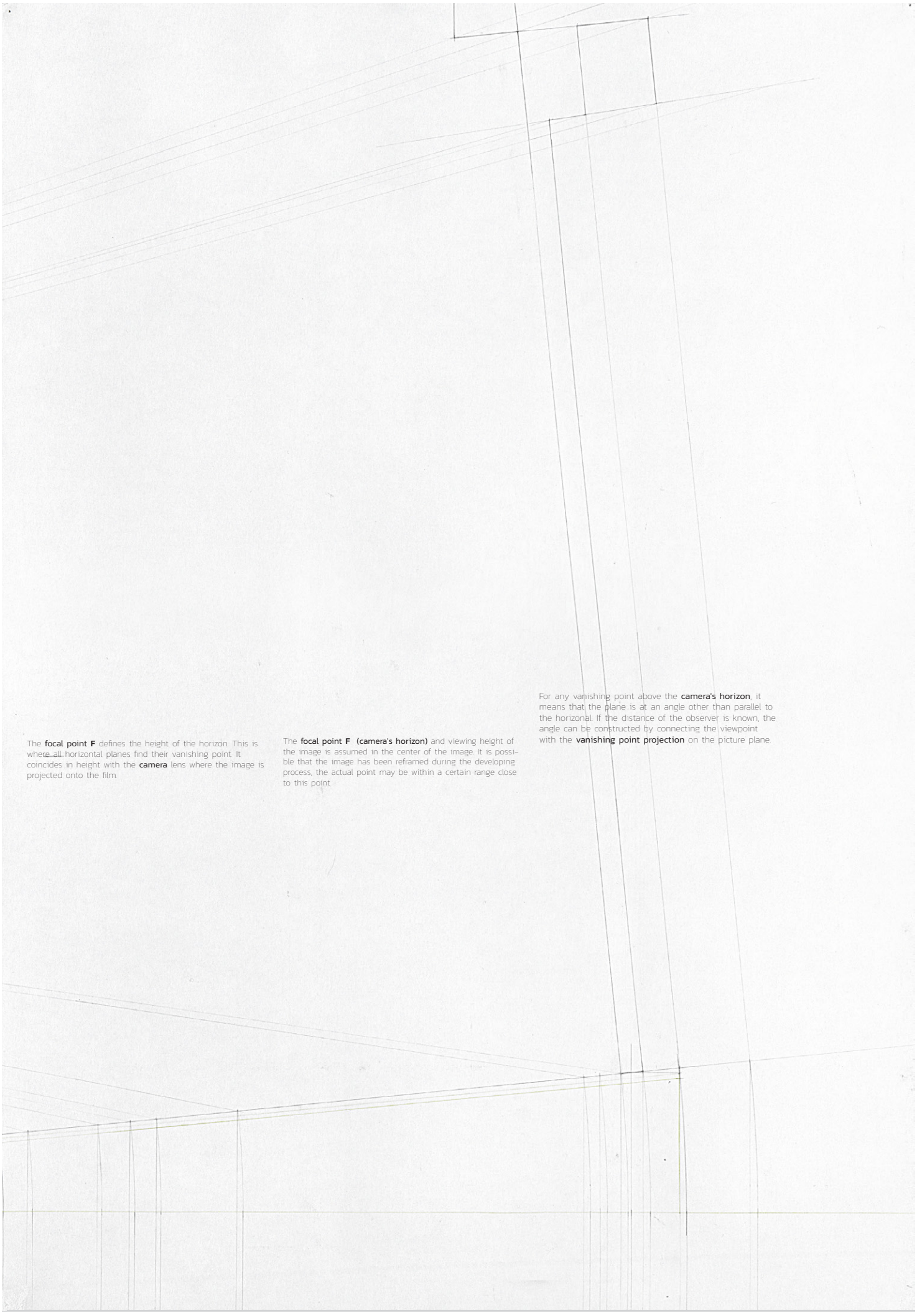
In effect, the **mirror** is not particularly large. To make a guess, how large it may be, a comparison with the size of **Newton's wife June** sitting partially in the same depth as the mirror right next to it may help. Her leg and her face, as she sits bended forward, are almost in the same plane with the mirror. Just imagining, her standing up, the mirror will probably be shorter or just the same height as her.

In order to measure out some of the spaces dimension, the floor is a useful element to pay attention to. The pattern on the plane surface gives strong visual clues about their spatial position and orientation.

Similar to a grid, used in landscape surveying, where it allows measuring out details of a mapped landscape, the floorboards define a plane with a vanishing point and enable the positioning elements in the space efficiently.

H position of the photographer (plan)

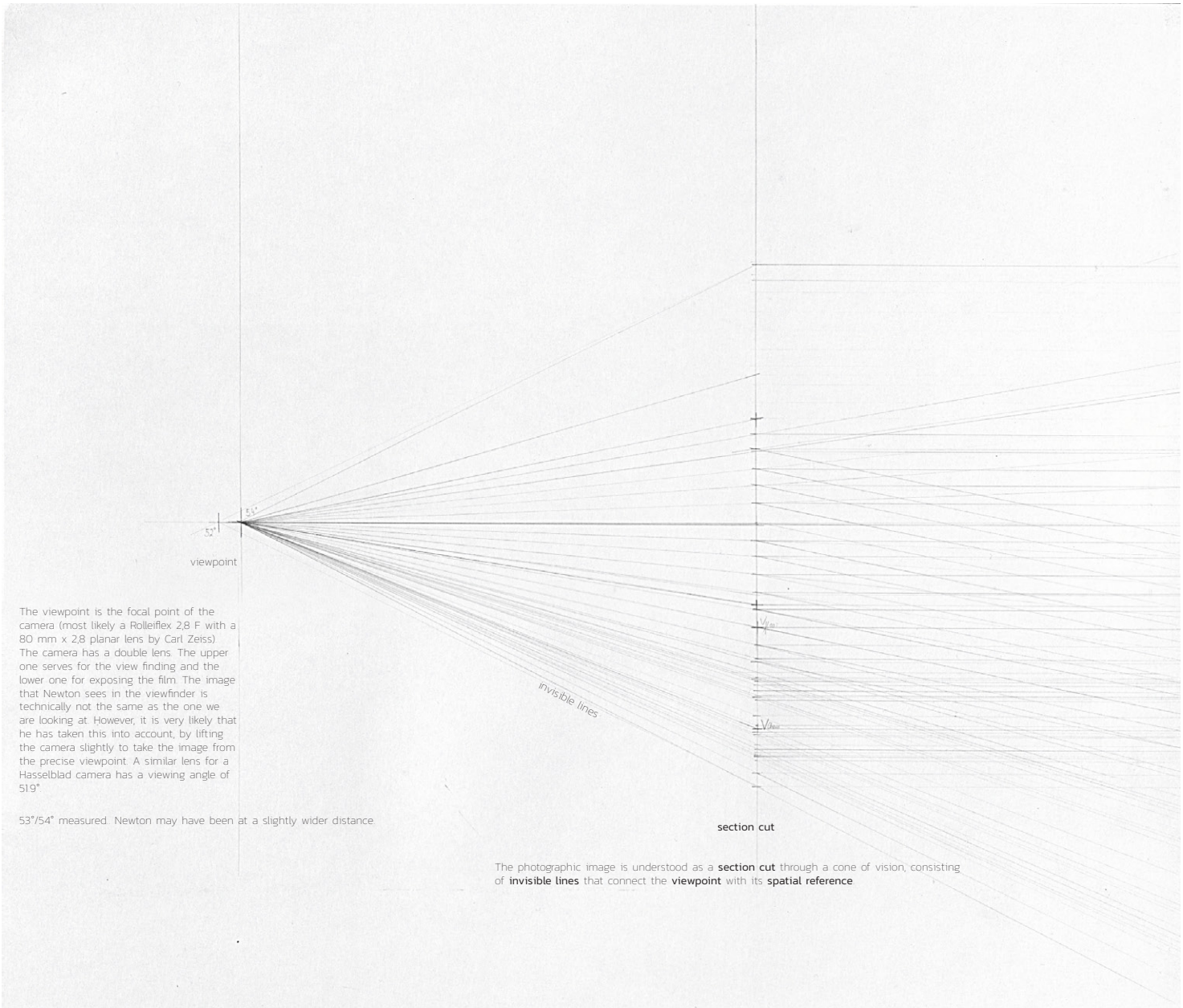
Another **vanishing point** is given in the reflection of the mirror. Even though we are made believe by the **parallel sides** of the mirror, that we are looking vertically straight at it, the floorboards give away a vanishing point below the **horizon**. As a consequence, the reflected space tilts downwards in the perspective analysis.



The **focal point F** defines the height of the horizon. This is where all horizontal planes find their vanishing point. It coincides in height with the **camera** lens where the image is projected onto the film.

The **focal point F (camera's horizon)** and viewing height of the image is assumed in the center of the image. It is possible that the image has been reframed during the developing process, the actual point may be within a certain range close to this point.

For any vanishing point above the **camera's horizon**, it means that the plane is at an angle other than parallel to the horizonal. If the distance of the observer is known, the angle can be constructed by connecting the viewpoint with the **vanishing point projection** on the picture plane.



The viewpoint is the focal point of the camera (most likely a Rolleiflex 2,8 F with a 80 mm x 2,8 planar lens by Carl Zeiss) The camera has a double lens. The upper one serves for the view finding and the lower one for exposing the film. The image that Newton sees in the viewfinder is technically not the same as the one we are looking at. However, it is very likely that he has taken this into account, by lifting the camera slightly to take the image from the precise viewpoint. A similar lens for a Hasselblad camera has a viewing angle of 51.9°

53°/54° measured. Newton may have been at a slightly wider distance.

The photographic image is understood as a **section cut** through a cone of vision, consisting of **invisible lines** that connect the **viewpoint** with its **spatial reference**.

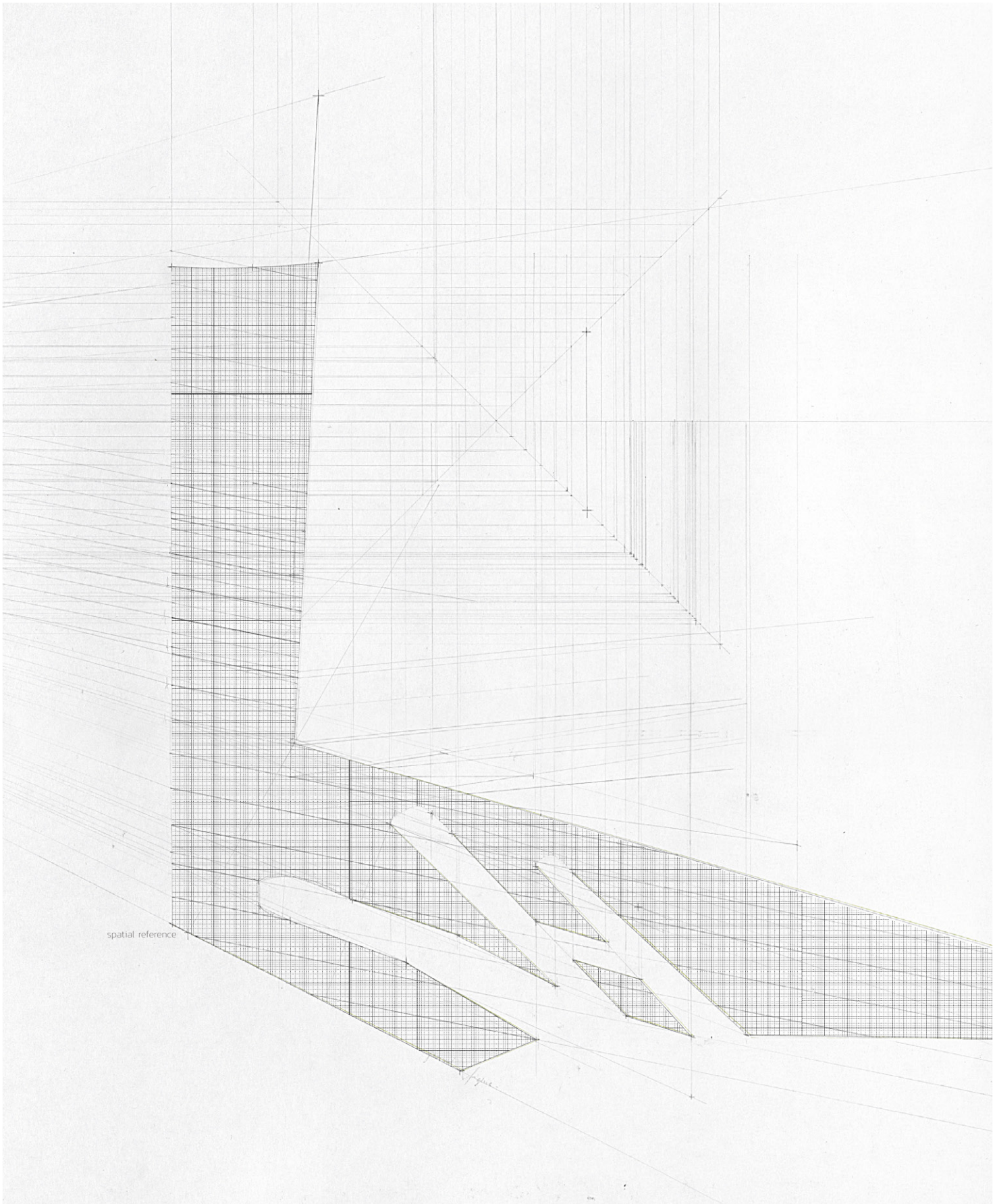
[*1] The large mirror in the centre of the image shows a scene with a photographer (which is Helmuth Newton himself as stated by the title Selfportrait) photographing himself at work, while taking a picture of two female models. The mirror must be large. It fits the tall women on high heels easily. The scene feels close to the viewer. Looking from the position of the photographer, we are very near to the nude and the space between her position and the edge of the mirror appears short, judged by the amount of ground reflected in the mirror. (Newton works a lot with contrasts in this image. In this case the white, strongly lit up backdrop supports the impression of a small spatial depth and at the same time brings the scene into the foreground)

[*2] I suggest that this may have been beneficial not only to fit the scene into the mirror, but also to emphasis some physical aspects of the female body. Initially her body appears stretched, but with perspective foreshortening, those parts of her body, which are closer to the viewpoint, become larger, while others seem smaller. Since her upper part is further away, it appears slimmer. This is subtle and gradual and most noticeable by comparing the head with the feet (even though they are stretched and small looking in the high heels.)

[*3] The floorboards in the mirror are mostly covered – by elements such as the white garment, but mainly by the white backdrop paper, a common element in photography. The backdrop is usually a wide roll of paper, hung from the ceiling and unrolled to cover background and floor. Spatially interes-ting in regard to this backdrop is the continuity of the vertical boundary and the horizontal. If Newton wouldn't cast a shadow onto it, the white space would appear infinitively deep. Instead, the space ends right behind him, where the surface receives his shadow. Being seemingly very close to the model, this makes him appear smaller than he possibly is.

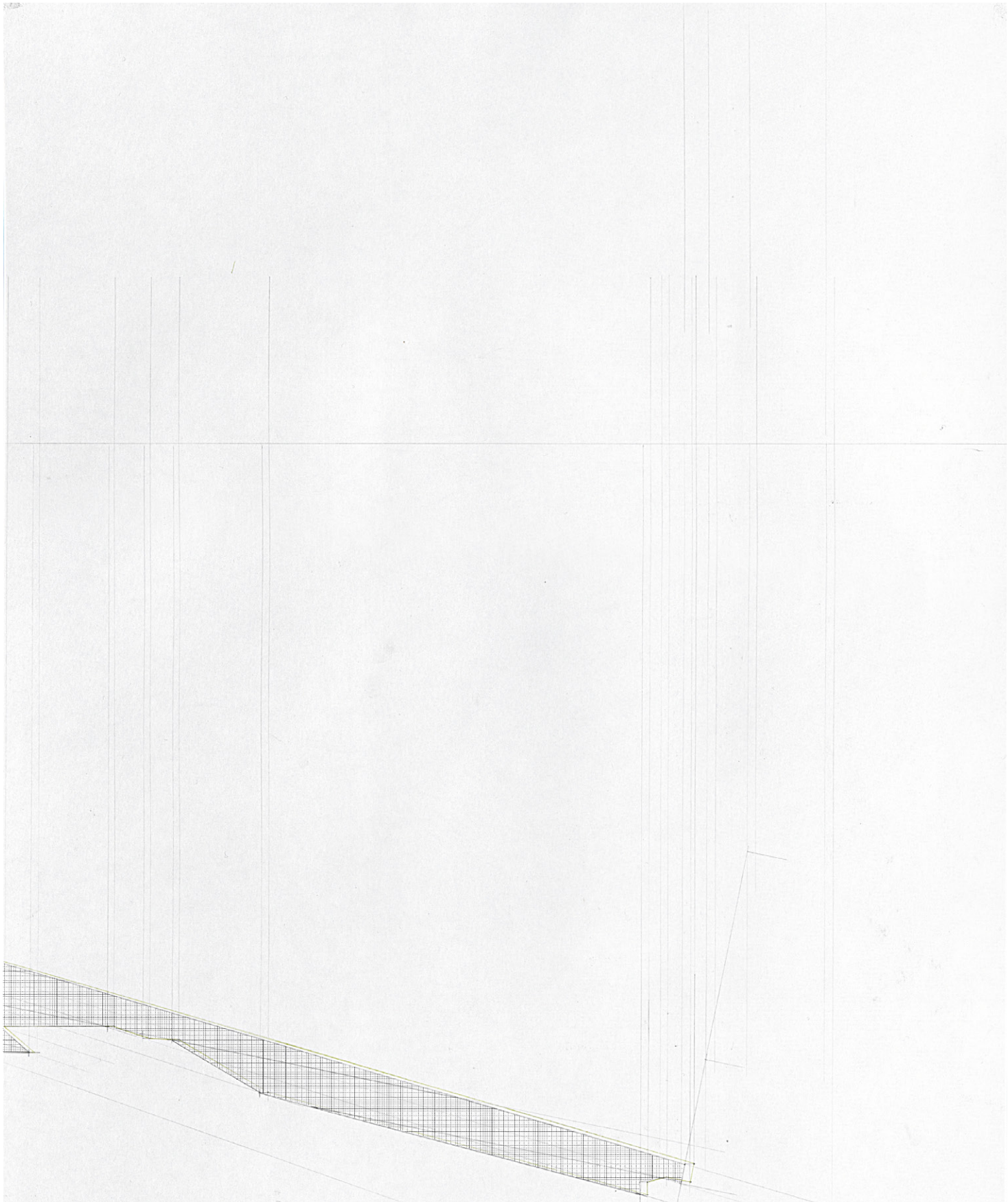
In effect, the mirror is not particularly large. To make a guess, how large it may be, a comparison with the size of Newton's wife June sitting partially in the same depth as the mirror right next to it may help. Her leg and her face, as she sits bended forward, are almost in the same plane with the mirror. Just imagining, her standing up, the mirror will probably be shorter or just the same height as her.

Still, my drawing suggests a height of about 1.75 m.



[*4] The garment is covering the floor and may function slightly like scattered trees on a lawn in a picturesque landscape garden. Usually used to blur the boundaries and staggered to give a sense of a deep space, this garment has the opposite effect by occupying the floor and covering the spatial depth that it would otherwise hold. In addition it emphasis the boundary that is created by the backdrop rather then disguising it..

[*5] The existence of two vanishing points for the floor produces a situation of multiple horizons. Focusing on the space in the mirror we are made believe, that our horizon is as low as the respective floorboard convergence point. It is important to note that this affects our sense of the scale of the room. Newton effectively obscures the fact that we are not looking straight into the space. The edges of the mirror being parallel tell us that the mirror is upright to the view, but equally the doorframes are (almost) parallel. This makes us expect that the room might be looked into horizontally, otherwise they would have a different angle and converge to their own vanishing point somewhere far below the horizon.



This in a strange way puts a conflict for our expectation of the floor being horizontal to the view. At the same time the image composition makes it hard to find clearly defined visual clues. Most obvious however is the fact that mirror and floor are not at a right angle. Not only is the mirror turned sideways, it is also tilted backwards relative to the horizontal.

[*6] The use of the camera lucida allows a working process between model and drawing. It is employed for the verification of the spatial analyis but also points towards further potential in the linking between the drawing process and spatial construction. Aimé Laussedat decribes in his book *La Métrophotographie* (1899) the benefits of using the camera lucida for geographical surveying. Even though camera obscura and photography have already been available, the precision of the camera lucida in avoiding lens distortion as well as the wider viewing angle of 60° instead of 25° possible at his time made it a viable solution. He applies the camera lucida in the *restitution of plan and elevation* from one perspective using a method called *Bildmesskunst* or *Iconométrie*.[1]

1 Aimé Laussedat, *La Métrophotographie* (1899), p.14ff

Figure 3: Photo by the author
***Drawing out: Partial model of the space in the 'Selfportrait' with camera lucida* [*6]**

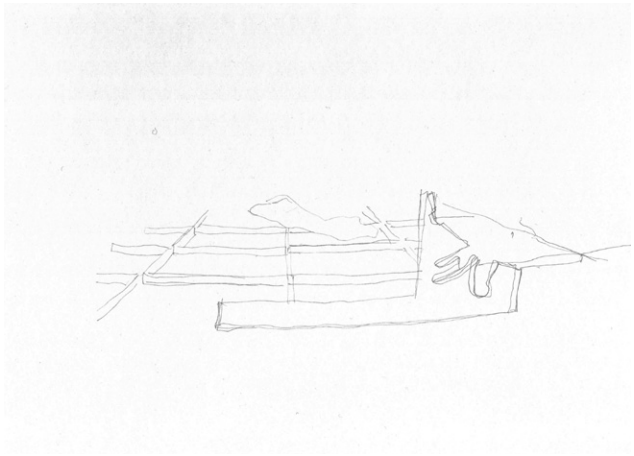


Figure 4: Drawing by the author
Drawing out: Camara lucida tracing of the model

Laussedat's camera lucida is fixed to the drawing board by two arms with clamps, which are set exactly opposite each other by means of the scales drawn on the edges of the board (...). The adjustments are made in the following order:
1. The drawing board is leveled in the same way as a plane table.
2. The upper face of the prism is levelled by means of the level shown above (...) and the slow motion screw at the side.
3. The principal point is found with a plumb line touching the edge of the prism (...). The distance from this edge to the principal point is the distance line: it is measured with a scale. It can be made longer or shorter by changing the length of the two side arms of the instrument.
4. Horizon and principal lines: Suspend a plumb line at some distance in front: turn the drawing board around its vertical axis till the image of the plumb line is seen passing through the principal point. This image is the principal line: it is traced with the pencil. A perpendicular through the principal point is the horizon line.[2]

2 Edouard Gaston Daniel Deville, *Photographic surveying, including the elements of descriptive geometry and perspective* (Canada: Topographical Survey, 1849) p.74

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Images

Figure 1: Helmut Newton, *Self-Portrait with Wife and Models, 'Vogue' Studios, Paris, 1980,* gelatin silver print (118.1 x 121cm.) © Helmut Newton Estate / Maconochie Photography

Figure 2: (p.3-9): Drawing by the author *Drawing out Helmut Newton's 'Self-Portrait with Wife and Models*, 'Vogue' Studios, Paris, 1980' (2018) (176 x 126cm)

Figure 3: Photo by the author, *Drawing out: Model of the 'Selfportrait' with camera lucida* (2018) (80 x 125 cm)

Figure 4: Drawing by the author *Drawing out: Camara lucida tracing of the model* (2018) (21 x 28 cm)

SEEING MYSELF SEEING - DESIGNING MY HOUSE

JOHN MCLAUGHLIN

Seeing Myself Seeing - Designing My Own House

Abstract
At the CA2RE Conference in Ghent in April 2017 I presented a paper titled *PhD by Prior Published Work – A Case for Appropriation*, outlining a PhD that would develop a position between the conservative attitude to research that values explicit knowledge, and the liberal one where researchers reflect on the tacit knowledge embodied in their work. I described this intermediate or hybrid position as an integrated paradigm where the constructed work and the written words act together as a "Dialectical Critical Practice" in which design is a carrier of knowledge.

At the CA2RE Conference in Ljubljana in September 2017 I situated these works within the wider discourse on architecture in Ireland since the 1980s. I examined the pavilions of Ireland that I had curated for the Venice Architecture Biennales in 2012 and 2014, and I situated them within a history of architectural representations of Ireland in the century since independence.

In the next stage of development I will explore the ways that these histories have influenced my architectural design process and the ways that the pavilion designs relate to my other design work; houses; landscapes; and other spaces. This exploration will seek to link levels of architectural knowledge across the projects through examination of their designs. In doing this it will shift the focus from the theoretical level of explicit knowledge articulated in earlier CA2RE papers to an exploration of the tacit knowledge embodied at the level of siting, structuring, and layering space.

By bringing this proposal to CA2RE Aarhus I hope to continue the process of peer-review that began in Ghent and to help to sharpen the quality of the emerging doctorate. It is intended that the subsequent stages of the PhD would be presented at the following CA2RE conferences in Berlin and Lisbon, as the research develops, in a manner similar to the PRS.

Keywords – *Design Process; levels of knowledge ; Tacit knowledge; Dialectical Critical Practice.*

Introduction

At the CA2RE Conference in Ghent in April 2017 I presented a paper titled *PhD by Prior Published Work – A Case for Appropriation*, outlining a PhD that would develop a position between the conservative attitude to research that values explicit knowledge, and the liberal one where researchers reflect on the tacit knowledge embodied in their work (1). This opposition between 'conservative' and 'liberal' positions was drawn from a paper titled *The 'thinkable' and the 'unthinkable' Doctorates - Three perspectives on Doctoral Scholarship in Architecture*, by Halina Dunin-Woyseth, that was presented at a conference called *The Unthinkable Doctorate* in 2006. She noted that doctorates in Architecture have a considerably shorter history than in other disciplines. Beginning in the 1960s in both the USA and the UK with certain differences between the models – "the new generation of doctoral programmes were called 'History, Theory and Criticism' (which often go under the acronym HTC), thus creating a specific field of architectural reflection" (2). She then went on to adumbrate the development of doctoral research in "practical aesthetic fields" in Australia since the late 1980s, notably the contribution of was Malcolm Gillies, a professor of music at The University of Queensland –

> "Gillies formulated three types of attitudes to the relationship between research and creative practice in practical-aesthetic professions. The **conservative** attitude is expressed by the short sentence "research is research". It is not possible to conduct research in the practical aesthetic

> fields as research means to objectively investigate 'problems'. This research is critical, analytical and historical in its character. Its results have to be published in a written, well documented form. These demands are most often contrary to the character of the practical-aesthetic fields. The **pragmatic** attitude, Gillies less elegantly termed "that awkward half-way house". Here the definition of research has been extended to include reflection and comments on aesthetic practice, often on the researcher's own production. That practice and its results are here being recognized as part of research process. This type of research needs, nevertheless, a substantial, textual work in a form that is similar to traditional academic research. The **liberal** attitude is based on the stance that creative practice and its products are recognized per se as research and they should be appropriately recognised as such" (3).

I went on to describe the intermediate or 'pragmatic' position suggested by Woyseth/Gilles as an integrated paradigm where the constructed work and the written words act together as a 'Dialectical Critical Practice' as advocated by Murray Fraser (4), in which design is a carrier of knowledge. I identified a pathway to PhD by prior published work as having the potential to enable this, provided that creative works of architecture that had been through a documented process of peer review could be considered as published works alongside theoretical texts and other explicit knowledge outputs.

In the second CA2RE conference in Ljubljana I presented a series of architecture biennale pavilions that I had curated and designed in collaboration with others, as examples of this 'dialectical critical practice' where the spaces functioned as embodied manifestoes of a theoretical position so that the sites became in Foucalt's phrase 'spaces of discourse' (5) rather than spaces of representation. In the discussion that followed, it was suggested that these pairs – tacit knowledge/design, and explicit knowledge/discourse – might not need to be in opposition but could rather be thought of as different levels of knowledge and that the dialectical critical practice might be about weaving between the different levels. It was also suggested that I should look at the tacit level of my own work in the context of the wider theoretical framing of the Ghent and Ljubljana papers. The series of papers are themselves being written in the context of a wider series of published works – built and textual.

In Ljubljana one suggestion was that I could consider Explicit knowledge/Tacit knowledge, not necessarily to be in opposition, and that it is perhaps more useful to think of them as different levels of knowledge. The Dialectical Critical Practice could be then be about weaving between levels. It was suggested that I look at the tacit level in one of my own creative works and consider its relationship to the history that I have written.

1 - The dilemma of dwelling

In her book *Architecture and Modernity: A Critique*, Hilde Heynen develops an opposition between architects who - drawing on Christen Norberg-Schultz's reading of Heidegger - seek to go back to an existential experience of dwelling in the forest, and architects like Peter Eisenman who - drawing on the French poststructuralists' insistence on architecture's "fundamental disharmony in the modern world" - argue that this must be confronted directly. Heynen resolves this opposition by drawing on the work of Theodore Adorno who accepted - '*the dual nature of artworks – that they are both socially determined and autonomous…one can argue that architecture as a discipline that has to do with the designing of space does involve an autonomous moment.'* In her conclusion Heynen goes

further and argues that in remaking dwelling in the contemporary world that architecture is capable of making us experience something beyond the normal and expected:

> "Architecture is capable of making us feel something of that which is repressed, that which exists beyond the normal and expected. In this way architecture can serve as a guide to the permanent quest for dwelling, not by embodying dwelling in any direct sense, as some Heideggerians might have it, but rather by framing it in modernity. This framing has, more than anything else to do with the way that architecture offers a context for everyday life." (7)

In subsequent publications, Heynen continues this strand of her thesis arguing that although 'we no longer share the optimism of the early modernists who thought that the *new* automatically would mean *better*. Instead we belong to those who believe that, back from Utopia, we nevertheless have to continue the struggle that initiated the desire for it in the first place.' (8) This challenge that Heynen and others laid out has been comprehensively taken up by practices like Lacaton and Vassal in France who have set about reclaiming modernism as both a project and a practice. In their manifesto *The City From and by Housing*, they say that 'Defending the pleasure of living seems to us eminently political today' (9).

2 - Seeing Myself Seeing: Surface

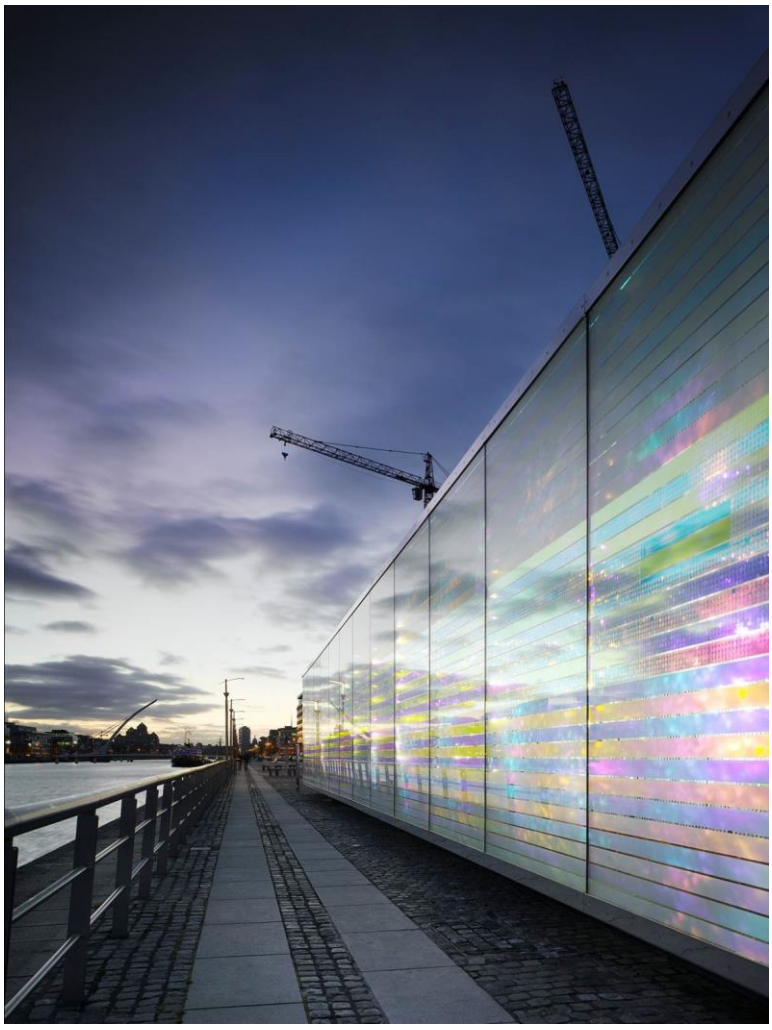

Figure 1: Above Ground Gas Installation, Dublin. John McLaughlin & Martin Richman 2010.

In the paper that I presented in Ghent I wrote about a small building that I had designed in collaboration with an artist called Martin Richman. When we began to collaborate we discovered a shared interest in the work of the Danish artist Olafur Elliasson, and specifically an installation called *Seeing Yourself Seeing* that he made in 2001. It consists of a sheet of glass with alternate bands of mirrored backing and transparency so that the sheet is divided into alternating strips that either let the observer see through the glass, or else reflect his image back to him. Martin and I then developed an idea based on similarly alternating bands of dichroic and opal glass in the facade treatment of a small gas transmission installation that we built in Dublin.

Daniel Birnbaum has commented that – *'Seeing yourself seeing*- is perhaps the most subtle piece, and so simple. It shows certain paradoxes of what it is to be a subject: you look at this small glass which is also partly a mirror, and you can either look through it or see yourself but you can never do both at once' (10). I remain fascinated by the visual effect of Eliasson's installation which always reminds me of Albrecht Durer's print of his perspective machine in his treatise *The Painters Manual,* of 1525, on which Barbara Freedman commented –

> *'Consider...how Albrecht Dürer's woodcut of a perspective painter plays out, reverses, and so complicates positions of right and erring spectatorship. Dürer's multiplication of pictures within this picture creates the theatrical effect of a dramatic interplay of looks. Not only do the windows frame nature much as the artist would frame woman, but we in turn frame the painter as well. The painter as a privileged spectator is himself displaced by being made the object of our act of looking. The complex relay of looks among painter, model, and spectator not only stages our look, but reflects it back to us in a way that we cannot but identify as theatrical'* (11).

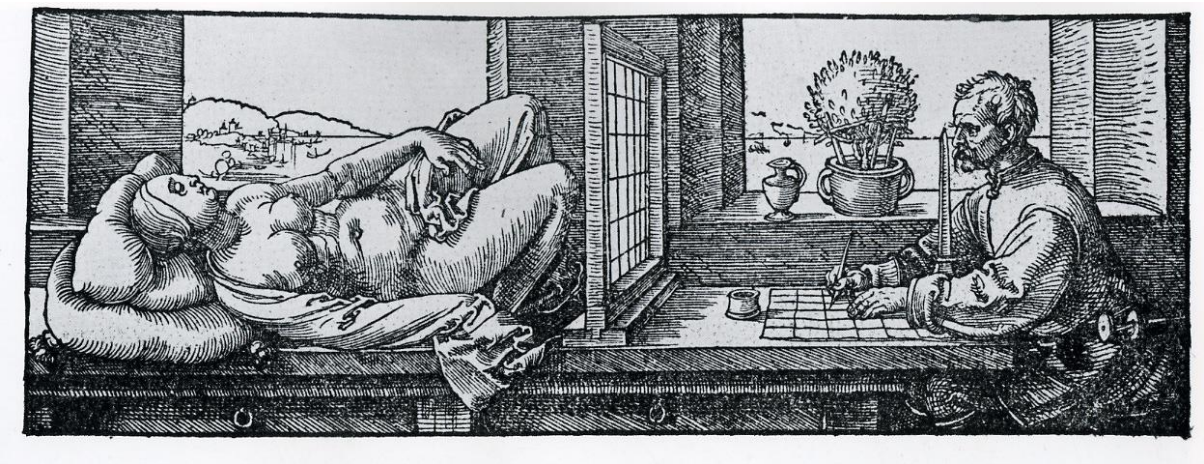

Figure 2: A Painter's Manual. Albrecht Dürer: 1525.

These operations within the visual field are something that I have deployed in exhibition pavilions and public art projects as a means of opening up constructed images to critical review. Inspired by Durer, I have often used spatial frames as armatures to make the viewer aware so that they can see themselves seeing.

3 Seeing Myself Seeing: Frame

My first independently designed building was my own house which I also built myself. The desire to build a house ran very far back for me to my first years as an architecture student when I was regularly told by my tutors that modern architecture was incompatible with the Irish climate and identity. Some wonderful houses had been built in Ireland by the post-war modern architects but these were rejected by the generation who were teaching in the late nineteen eighties and early nineties. *The Goulding House* – by Ronnie Tallon is one of the most famous modern house in Ireland. A steel framed cantilever - it literally floats above a river valley even more than Pierre de Koenig's *Stahl House* floats above Los Angeles. It was a ruin at the time that I was a student (though it has since restored).

Figure 3: Goulding Summerhouse. Scott Tallon Walker Architects. 1973 (Restored 2002).

Other Architects of that generation like Neil Hegarty had had designed housing schemes inspired by Mies' Lafayette Park in Detroit in the suburbs of Cork City.

During my studies I came across a book by Ignasi de Sola Morales called *Minimal Architecture in Barcelona* that detailed his efforts to have Mies' famous pavilion reconstructed, and showed contemporary projects informed by a sensibility to detailing informed by Mies (12). I won a travel scholarship to visit Barcelona to visit this work and to see Mies' pavilion. I surveyed it precisely and prepared a set of measured drawings on my return to Dublin.

I still struggled with the established view in my school of architecture, and the emerging tendencies in Irish architecture, so after my studies I emigrated to France where modernism was still generally accepted. I visited many buildings by the first generation of modern architects and read about the history of the movement. Many of my work colleagues had studied under Henri Ciriani at UP XIII Belleville where Ciriani had developed a design method from deep research that he had done on spatial expansion in the houses of Mies and Le Corbusier. This had been published in 1989 and,

though out of print in the mid-nineties - I was able to photocopy a friend's copy the report and to study the methods explored there (13). I also read about the modern houses in Scandinavia, and learnt that architects like Jorn Utzon had often used timber frames of their houses, and that this form of construction had the potential to solve the problem of cold bridging that was sometimes cited as a failure of modern architecture in northern Europe.

After a spell working in London, I returned to Dublin and got married. My wife, who is a keen gardener, and I purchased a small infill site that was a former vegetable garden, with the intention of building a house for ourselves and our children. We were conscious that our budget was limited so that we could only afford to build a house of a certain size. The building line of neighbouring houses and other site factors suggested a footprint of just under 80m2 and a maximum height of two storeys.

I thought about the levels of spatial organisation described by Bernard Leupen in his book *Frames and Generic Spaces* (2006). Leupen lists five levels from the road/street network, to the structure; envelope; partitioning; services; and access. Leupen draws on Heynen's dilemma of dwelling and suggests that the solution to the dilemma can be approached by fixing and releasing aspects of architectural control so that the house can reconfigure and change over time. He introduces three types of flexibility –alterable space; extendable space; and polyvalent space. This last category can be reconfigured by mobile elements like furniture and utensils. In Leupen's elaboration of Heynen's thesis, everyday life can be framed by movable and fixed elements (14).

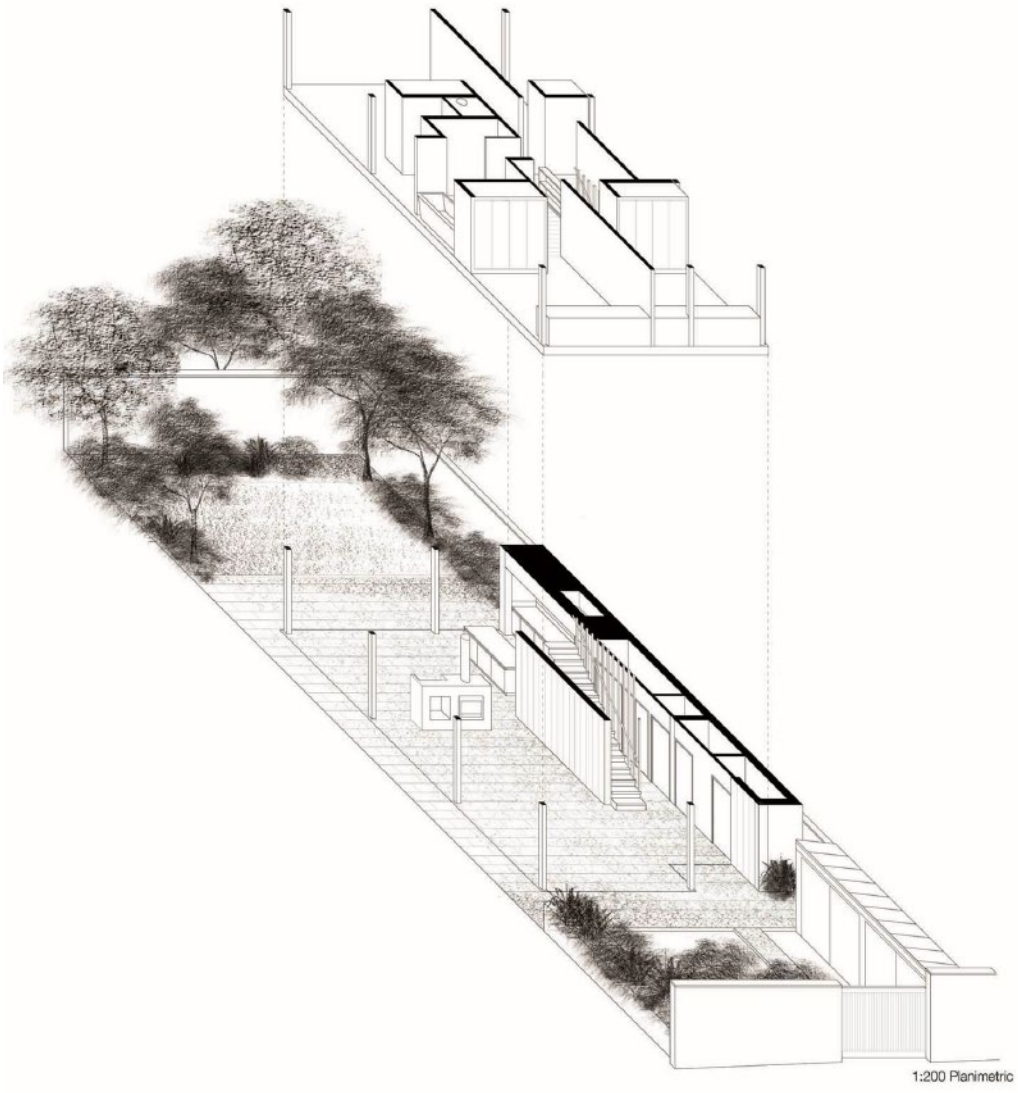

Figure 4: McLaughlin House 2013: Planimetric Drawing

Figure 5: McLaughlin House: Entrance Front. 2013

My wife and I decided to build a framed structure with large areas of glass to maximise daylight and the connections between house and garden. We imagined a field of vision expanding out through

the glass façade and back through the house expanding the sense of space to include the whole site which measured almost 270m2. As one of the sides was to be an external passage from front to back, we glazed this with opal glass above head height to give the impression of a continuous band of glazing around three sides of the living area. We plastered all of the garden walls with a similar plaster to that used internally to reinforce the sense of a continuous field that is enclosed in a wall high enough to contain it. We populated the house and garden with plants and furniture that blur the distinction between inside and outside.In contrast to the ground floor - the first floor is less glazed and is heavily insulated so that it is more private visually. This is clad in timber so that it appears as a box sitting above the visual field of house and garden.

Figure 6: McLaughlin House: Ground Floor Plan. 2013

In the first version of the design I had located the fireplace on the wall along the side passage but I made a number of perspective studies and decided to move it out into the open plan to make a division while leaving the space open. This had the effect of layering the space and increased the sense of depth while still allowing views through the house. Adding furniture to the plans showed how this too could contribute to a sense of layering along with plants in pots.

Figure 7: McLaughlin House: Kitchen/Dining Area. 2013

We had very limited money so we built the house ourselves. I had built a number of buildings in concrete and steel but had never used timber as a structural material before and I was surprised by how versatile it is. The construction involved pouring a concrete raft foundation and building a low rising wall off that to support the sole plate of the timber frame. The frame came prefabricated from a factory and I was able to fix the insulation and membranes myself. The fabricators showed me how

to lap the joints. I also stained the cladding myself and employed a pair of carpenters to cut and fix it. The timber structural members do not conduct heat so unlike concrete and steel, the structure can be expressed through the envelope meaning that the wall is thinner than in masonry construction. Above the floorslab we layered insulation and then poured a concrete screed containing heating so that the floor has a thermal mass that heats the space and the heat then rises and is caught by the heavily insulated first floor box that floats above it. The structural engineer explained to me that in concrete and steel construction the problem is to transfer the loads to the ground, but in timber construction it is to stop the house flying away in the wind. As the build progressed, I started to enjoy the quality of material lightness of the structure and the sense that it is structurally lively with a spring to it. On stormy nights the whole house quivers slightly in the wind. As I reflected on this, I realised that most of my contemporaries were pursuing materially heavy solutions in architecture rather than light ones. I realised that there was a shared set of assumptions underlying much of the critical architecture being produced around me that tended towards weight and permanence – towards a Heideggerian concept of dwelling.

Figure 8: McLaughlin House: Library. 2013

Lightness

As an alternative to the Hiedeggerian tendency towards weight and permanence, I see the lightness of frames as being capable of accommodating evolution and change. By its economy of means, the frame rests lightly on the earth and frames our experience of it. The vertical members tether our sleeping bodies to the ground so that they don't drift away on windy nights. In 2016 I read Ciorra and Ostende's book *The Japanese House: Architecture and Life after 1945* where I found this text that resonated with my own experience of building lightly:

> ‘Thinness”, “translucency”, “flotation” – these terms convey some of the various connotations which have attached themselves to “lightness” over the last seventy years of Japanese architecture. If architecture is produced at the nexus of human lives, technologies, and natural resources, the lightness or heaviness of buildings might be read as a metaphor of its historical and social context. A grand and expansive construction process requires a dense “heavy” network of funders, architects, builders, resources, and stages of decision making. In contrast, the “lightness” of the individual house is perhaps what enables their performance as critical spaces, architectural experiments which might float above the constraints and ideologies of the wider social and economic landscape’ (15).

Since building my own house, I have gone on to design several others using timber frame technology, and we are currently undertaking research on mass housing and exploring the potential of Cross Laminated Timber (CLT) in addition to frames. We are increasingly interested in the mapping of performative aspects of dwelling onto framed spaces, and are pursuing an architecture where spatial flexibility and technical performance converge (16).

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ARCHITECT'S HOUSE: A SELF-ANALYSIS

RICARDO SENOS AND EDITE ROSA

Architect's House
A self-analysis

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ABSTRACT

The research starts from the opportunity to explore the exceptional architectural production resulting from less usual situations in the productive activity of the architect: the design of his own house. It question if a "home" design project "for" the architect, can generate also a theory of architecture parallel to the discipline in the act of designing. An understanding of concepts, ideas, motivations and impulses as decision-making, thus constitutes a premise of this research. From this universe of more limited and specific central character, the architects own-house designed by himself, it is intended to reveal other "thinking mechanisms" beyond what seems to be more common in design practice. In this article, as a possibility among other examples, the Alvar Aalto ´s Muuratsalo Experimental House, as a case-study that testes some of the research concepts essential to, approaching what may be different in the "mechanisms of thinking" of the architect´s self design from his professional activity for others, as problem of architecture to promote reflection.

1. SUMMARY

The relationship between the architect and the client departs, almost always, from distant points of view, despite the common purpose of convergence and approximation. It is therefore from this understanding of a complex sharing that, by the act of designing, architecture as a discipline is instituted. It sums up the concrete answer, established between its interpreters: the client and the architect.

Not so common, although the vast architectural historiography examples, is the production of architecture from and for the architect´s own use. The theme of the architect as author and user of the space he conceived, sets the will and impulse for a research that starts from the most exceptional and sensitive side of the discipline. This means an assumption of an apparently unidirectional relationship, by the annulment of the client, at least in its more traditional form.

Also the house program has been considered as a laboratory of architecture, where new ideas and concepts are tested and tried. Ábalos (2008), in the "Good-Life. Guided visits to the houses of modernity", establishes relationships between contemporary domestic culture, the relation of forms and ways of living,

and the several contemporary philosophical thoughts.

Combining the two interest described above the research focuses itself on the single-family housing through the *architect's home* to be carried out by the analyses of modern´s 20th-century domestic architecture production. These studies-cases are recognized by the main historiographical studies supported upon authors who designed, built and inhabited their own home.

The purpose of the research is to investigate if there is a change in the design methodology, when *removing* the figure of the "client". To find out whether the design project is more or less justified and if it seeks to clarify the reasons for the options taken at each stage. Finding out in this process if there are new mental links that to be described, represented and transmitted to other peers, close the objective of the research.

- Does there exist different mechanisms of thinking in the architect's performance when he designs for himself from when he designs for others?

- Which architectural tools may identify, sort, analyze, expand upon and understand these mechanism of though?

-Comparatively to the more conventional situations of architectural production, has the design of the architect's own house added reflection to the discipline?

2. POINT I (THE HOUSE AS A THEME)

Starting from the existing collection considered relevant by the architecture historiography of the “architect's own house”, this paper intention´s is to: first, become aware of the quantitative, qualitative and progressive significance of these existing experiences; secondly, to anticipate the practical and methodological progress to find resonances in the concepts and theoretical presuppositions, fundamental to the research theme.

The objectivity, in the scope of the theme, of definitions where the initial concepts, within an Abdup method came from the researcher´s specific design interests, are essential so that one can find the necessary and adequate tools to be chosen and the selection criteria case-study analyses.

Rossi (1975) uses this approach when he refers that the type approach in architectural design enriches the discussion about the design method, by the possibility of integration between logical and analogical thinking, being this process adopted in this paper.

The concept of the HOUSE AS A THEME establishes the connection for action- investigation within the objective of shielding and later operationalizing the research with the support of the case studies. In this sense, the following themes (concepts) of interest are establishes:

1. **THE HOUSE AND TERRITORY** - FORM OF THOUGHT
2. **THE TYPOLOGICAL HOUSE** - PROGRAM NUCLEARS
3. **THE HOME CONTEXT** - REFERENCES OF THE PLACE

4. THE HOUSE AND ABSTRACTION - PROJECT ANALYSIS MECHANISMS

5. MATERIAL HOUSE - FORMAL PERENITY AND EXPRESSION

In this work, the first concept THE HOUSE AND TERRITORY - FORM OF THOUGHT, is explored in section II, only as an essay for a future selection of other case studies and their analysis tools.

The criterion at this stage for the selection of the house of Alvar Aalto (1952-54) - (Muuratsalon koetalo) corresponds to a first experience, which covers not only the first concept named above, but also as fitting other of the investigator interests and reflected upon this case-study. The choice of Alvar Aalto´s house between others explorations (local, configuration, etc) meets the investigator interest strongly in the use of the author own house as an laboratory to test different, materials, materiality and constructive details

.

This first concept, although related to the author's own-house geographic site based on more generic constraints (see **Point III)**, is chosen at the same time a starting point that justifies the type of configurations of the researcher´s design interests. In fact the selection of the cases-study houses, present as a common factor interventions in isolated lots, and therefore a dispersed and free relation with the landscape.

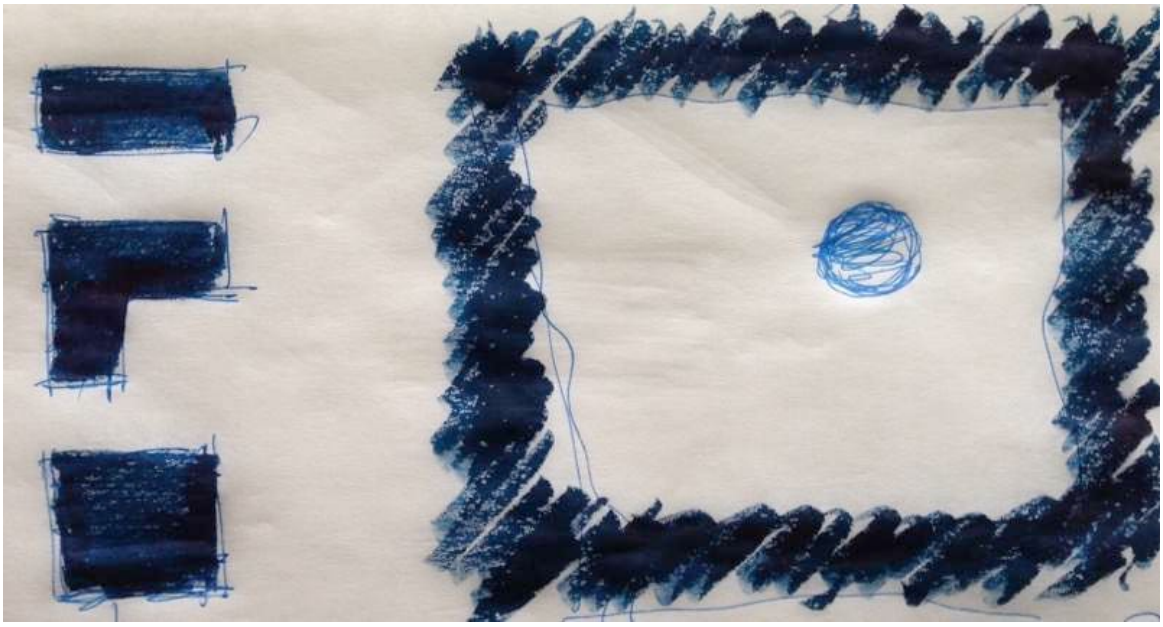

Figure 1

A flexible place. He fits an experimental sphere making it more intense due to the multiplicity of hypotheses of orientation of buildings in a given territory. - Author's drawing, Ricardo Senos

Vacchini (2009), reinforces the abstract character of the pyramid of Giza configuration, which in itself represents a solid oriented and isolated. For him, it is important to focus on the overall character, not only of the pyramid as an isolated element, but the group of pyramid as "(...) the truly extraordinary form of arranging the pyramids on the ground that unifies the implantation."

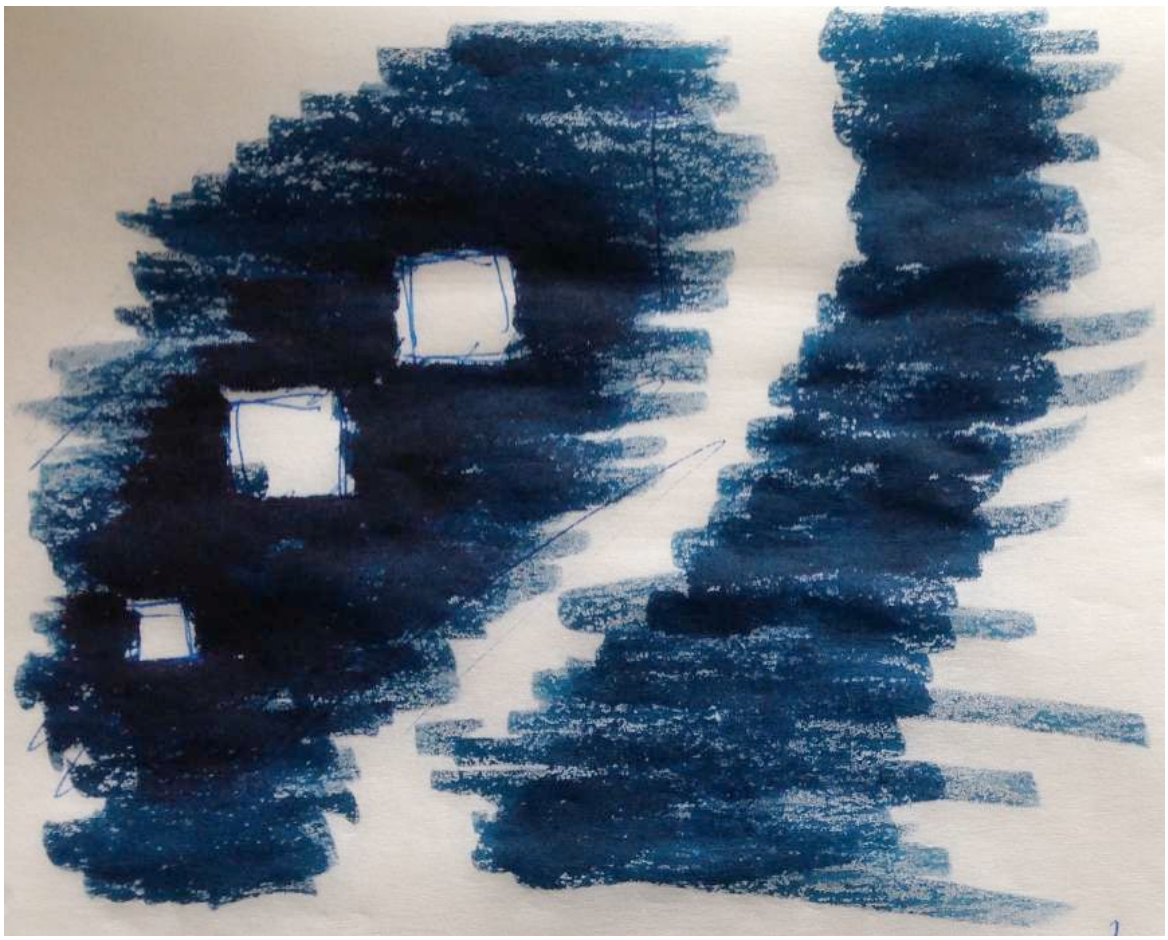

Figure 2

Orientation as a way of thinking. Layout of the Pyramids of Giza. - Author's drawing, Ricardo Senos

Vacchini defines the whole reason for the need to guide a set as consisting of elements that in themselves are organized in a simple intuitive and objective way, if we have as reference the river Nile.The impulse that determines the disposition of each object in the territory and stipulates its formal rhythms is therefore the differentiating element. It is in this sense that for Vacchini (2009), thinking architecture is nothing more than a logical gesture of thought.

3. POINT II (CASE STUDY)

Alvar Aalto (1952-54) – The Muuratsalo Experimental House

This project of Alvar Aalto expose, as mentioned, as a pre-essay for the paradigmatic cases- study selection of the first concept: THE HOUSE AND TERRITORY - FORM OF THOUGHT. However, in this paper this case study, Alvar Aalto´s house, will also work as an short essay for the other themes (concepts) due to the fact that they are also present, although with much less relevance. In fact in the final thesis probably to each concept will correspond mainly one case-study, the most paradigmatic architect´s own-house for each concept/theme.

The Alvar Aalto´s own-summer house represents an example of extreme importance as its design

process turned into an experimental study for the author himself. The understanding of the place, the constructive aspects, the resistance and aesthetics of materials and ideological and formal factors, draw some of the main reasons that motivated the design options.

THE HOUSE AND TERRITORY - FORM OF THOUGHT

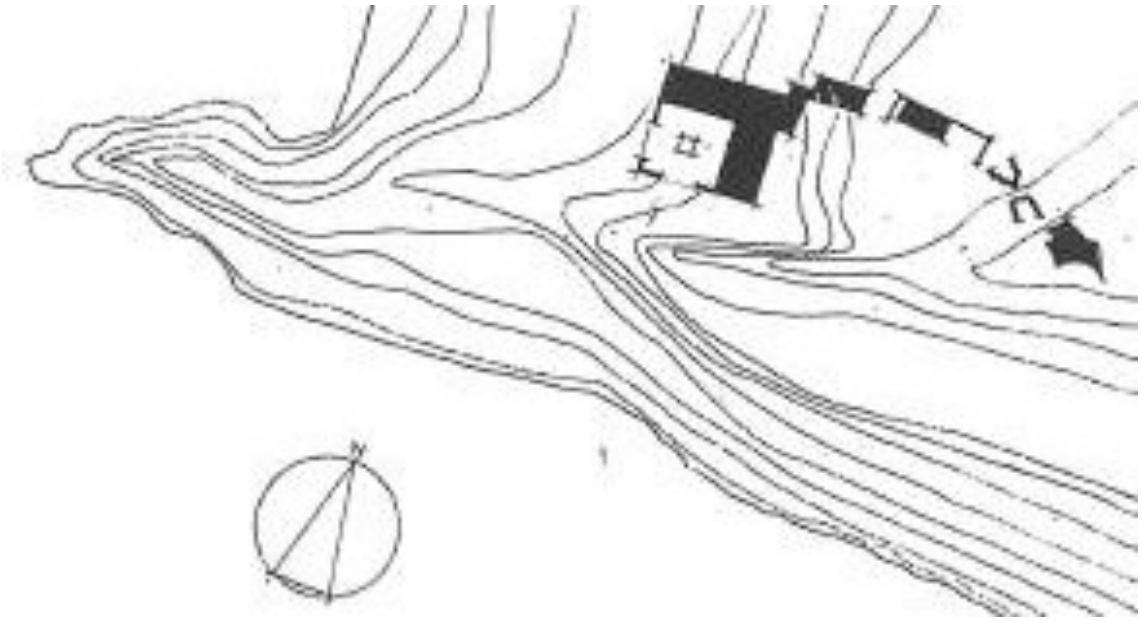

Figure 3

The House implantation on sloping terrain. It evidences the exploratory design sense, closer to nature as a form of inspiration. The graphic movement of the set commits itself to the topography by turning the house and its patio to the lake Päijänne.

Figure 4

The grand opening of this patio organizes itself according to the views, framing the lake, analogically referring to Vacchini's thoughts (2009). The landscapes as an essential point for architecture, such as the relationship of the pyramids with the river, regardless the notion of a free territory with immense possibilities of orientation.

THE TYPOLOGICAL HOUSE - PROGRAM NUCLEARS

Figure 5

Aalto, does not fail to have a functionalist view of architecture when it articulates typological and volumetric sectors. According to Montaner (2013), it is a rationalism based on the reasoning and accumulation of experience, but it is essentially based on a design point of view of the concrete and of the detail, not so much as an ideological model. The volumes and the plan also show the spaces organization of programmatic nucleus distinguished by function.

THE HOME CONTEXT - REFERENCES OF THE PLACE

Figure 6

Affinity with the climate and surroundings. The House is receptiveness to light and climate with particular attention to the natural character of the environment. Architecture and spatial atmosphere is more experimental, less focused on the image.

THE HOUSE AND ABSTRACTION - PROJECT ANALYSIS MECHANISMS

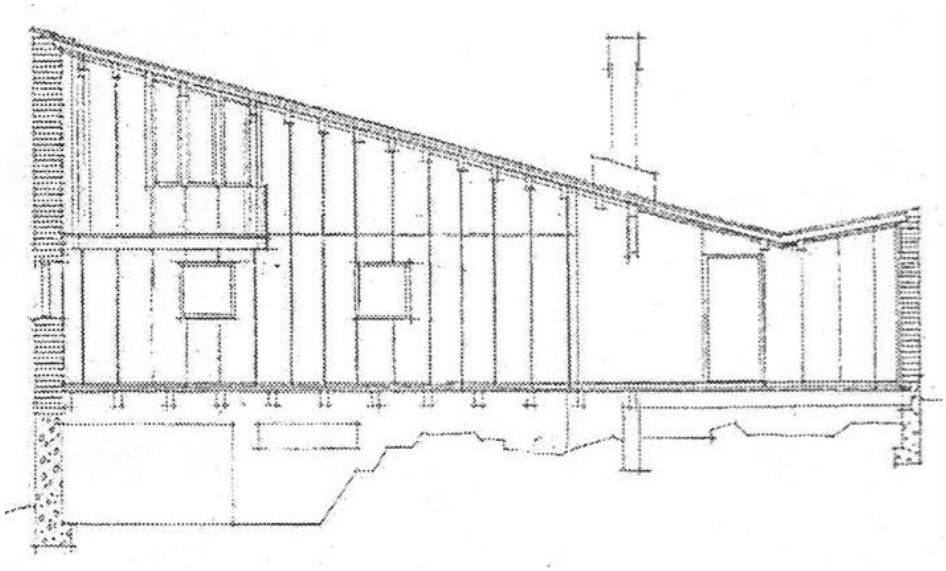

Figure 7

Implantation essay of the house on the sloping terrain. The constructive section evidences systematization of detail and rules criteria, although the structural character is based on local techniques such as the use of wood. Therefore, it is rational in its schematic sense and its rule systematization.

MATERIAL HOUSE - FORMAL PERENITY AND EXPRESSION

Figure 8

The local as an essayistic space for material character (textures, weathering, aesthetic and compositional testing), in its formal expression and durability with particular attention to the detail of experimental character. The several design compositions in the house reacting to the climate configuring the notion of a Place.

4. POINT III (Design of: the author´s own house)

The design research is led through the development of the **author´s own house** as an experimental opportunity between design thinking and its research methodologies, logical in the discovering of the reasons of design and analogical in the case-study comparison. This nevertheless require tools (tools of analysis) to identify, classify, analyze, expand and understand each discovery and that is why the theorectical concepts combined with the understanding of the reasons underneath the design and its drawings described in the case-study above are so important, although there is of course still some ambiguity in defining the whole methodology at this stage. Montaner (2013) emphasizes the importance of abstraction as a mechanism of projectual analysis, provided it has to do with life, as a vehicle for interpreting reality and improving it.

Thus, the use of diagrams (as graphic thoughts and analyses) may also in the thesis process make sense, as it may be able to incorporate the data of the experience. However always taking in account Frayling (1993), question: What is research in architecture? For the author, designing a building does not necessarily mean adding knowledge. For that, it is necessary to understand the process itself and to question the role of the produced object, after being designed and constructed, in a much more justified and comprehensive way.

Figure 9

The site for the design of the author´s own house. A terrain as an idea of a flexible place with multiplicities of orientations for a house in its territory. It refers itself to the concept of: THE HOUSE AND TERRITORY - FORM OF THOUGHT. - Author photography, Ricardo Senos

5. EXPECTED RESULTS OF THE RESEARCH

From the case studies analysis, we expect to investigate beyond the designs and images of the projects themselves, trying to understand also the circumstances of the design of the houses executed by their authors. An investigation that is necessary in order to find the reasons inherent in the social, mental or philosophical states and contexts that led architects to fix their ideas during the challenge of designing their own home.

Personal inputs: to improve and add awareness to the options that professional practice is making available. To promote greater comprehensiveness and flexibility in the architecture experience that must be inherent to the practice, by allowing calling into question criteria apparently acquired and sometimes unconsciously reproduced.

Discipline inputs: It is hoped that, through a careful and systematized methodology, it can be transformed into a concrete research, due to its experimental nature and understanding of the “design mechanisms of thinking” and trying to make it interesting to also peers. To centre the architecture discipline also as science, by the possibility of rational and plausible explanation of the facts in the various moments of the invention.

Thus, it is hoped to add other consciences to the profession, approaching what is the research of the architect as a self-analysis, and what is his professional activity at the service of others.

By consider as an exception the elimination of the relation between client and architect, the deontological values of the profession are believed not diminish, but constituting themselves as the differentiating starting point in the study of what is architectural practice. In the author / researcher subconscious are present such questions: -"is the architect's own house really without a client?" Do architects live alone? What is the role of my own experience in this work? How can we frame the author's design change over time? How to learn from such “inconstancy”? What changes and what stays in the process, and why? How to choose, adequate or deny the analysis of the case-studies?

The jury's criticism were essential and very constructive due to the have pointed out two facts:

Firstly that the “study of the "architects own house" can certainly be fruitful to broaden the understanding of the "mechanisms of thinking" but needing also necessary tools to identify, sort, analyse, expand upon and understand the findings.

Secondly by advising that although the architect / author can represent "the more informed user" being "(the architect himself)” it is also to also be re-evaluated if this is as a way of gaining understanding of oneself or also of our discipline educational constraints or sensibilities. In this sense a finding might also be what kind of self-discipline “mechanisms of thinking" to handle with care, meaning with a critical consciousness.

Therefore, the architect's own-house is seen as a problem of architecture itself, where the process itself promotes the reflection of the invention process. It seems to us in this way the final results will not be confined only to the final result of the architect's own-house design, but rather the problematic from the themes introduced and raised by the practice itself during the design of his house.

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THE BAY AS STRUCTURAL DESIGN DEVICE
THE PARADIGMS OF THE REINFORCED PROTOTYPES FOR FACTORY IN ITALY (1950-1975)

VITO QUADRATO

THE BAY AS STRUCTURAL DESIGN DEVICE. THE PARADIGMS OF THE REINFORCED CONCRETE PROTOTYPES FOR FACTORY IN ITALY (1950-1975)

Introduction

The idea of the bay as architectural device takes shapes in the XIX century as a fundamental topic of architectural composition. As Jacques Lucan (Lucan 2017) said, the Viollet-le-Duc and Choisy's theory recognizes the construction as a new paradigm of the composition. From this perspective, the idea of the bay has a crucial role: it is no longer simply that of the space between architectural elements, but it stems from the dimensional and grammatical relationship between the members that determine a structural span. In this sense, it is no coincidence that the idea of the bay consolidates with the development of French architectural treatises on the issue of the construction. These treatises of construction used the term "bay" as a segment of the design that summarizes the whole building, because it implies the possibility of these parts of the building to be repeated in a sequence. In this sense, the bay is an open system of construction that, like the Choisy axonometric views (Choisy, 1899), goes from the bottom to upwards, reflecting the sequence of the steps in the construction process that starts from the foundations and finishes with the roof. Indeed, the bay consents to establish a set of rules, that, as in the cathedrals drawings, the builder can transfer from a construction to another. From this point of view, the design of the bay departs from the synchronous control, by the designer, of the structural elements, schematically identifiable by two kind of relationships: the support/coverage/foundations system and the distance apart one and other of them that tests the unit structural system validity. This idea to conceive the architecture lies with the Modern idea of repetition, prefabrication and assembly.

As highlighted by Jacques Gubler (Gubler 1985), the design process that leads to the definition of the bay, passes through a "reasoning by recurrence" , recognizing the bay itself as a device potentially repeatable, a structural unit of the architectonic organism. The process of construction industrialization that concerns to the Modernism revived the notion of the bay as a feature of architectural design, taking on the idea of "reasoning by recurrence" as a *conditio sine qua non* for the definition of the built Form. According to this process, the risk on the concept of the bay was its degeneration in a purely structural fact, applied in a mechanical and slavish way. On this aspect, Luigi Moretti (Moretti, 1951/52) asserted the difference between formal and informal architecture: "*an architectural work is both a reality and a representation, if, naturally, it exists a will of representation, that is to say an expressive will. The lack of this will determines the absence of architecture and the building has only structural and technical features; in this way the building is subject to the ageing of the technic and not to the immutability and immortality of the Form*." However, how the bay, a system so rigorous can produce an idea of architectural expressiveness? Indeed the risk on the concept of the bay is its degeneration in a purely structural artefact, an informal building. Hence, the probable answer to the question brings to light the dual nature of the idea of bay, metaphorically traceable in the history of architecture.

The first one deals with the possibility, implicit in the bay, to identify the strong link of the assembly of structural elements and a clear overview of their construction methods; the second one recognises the value of the bay in the sequence that comes out from the hierarchical aggregation of the parts, the "expressive concatenation" , according to Moretti's definition. In this first case, the expressiveness of the architectural building depends on the syntactic paradigm of the structural elements' grammar and by their topological and hierarchical definitions. Consider, for example, the project of the Arnolfo di Cambio's two projects for the ciborium of San Paolo fuori le Mura and Santa Cecilia, described by Arnaldo Bruschi (Bruschi 1998) : "*in both cases, the ciborium was conceived in a three-dimensional way, as a canopy or an ideal square bay; that is to say as the elemental spatial module of the European Romanic-Gothic tradition. […] The layout of the adopted solution […], is a syntagm, a comprehensive system of elements, none of which is independent from the others, or, on the contrary, it transforms substantially the whole of the building. Even if one were to make the arch greater, keeping unchanged the layout, it should increase also the lateral frames, the overhead gable, and then the supports. Arnolfo tends to identify an architectural*

drawing coherent with the construction needs, but first of all, valid in itself, autonomous and invariable respect to the physical dimensions". The case of the Arnolfo di Cambio's ciborium is the ideal metaphor of the synthetic power of the bay to prefigure the built form. The part, constituted by the device bear-pillar-foundation, represents the whole of the building and it is a guarantee of an architectural expressiveness. The second nature of the bay, as stated above, focuses on its inclination to become a sequence of spaces. Around this notion, Luigi Moretti constructed the logic structure of his essay "*Strutture e sequenze di spazi*"(Moretti 1952/53). Indeed, the Roman architect the author wrote: "*The survey should cover the spatial unit formed by inner volumes, which compose a layout and a concatenation; they establish, with the changing of their perspective and in relationship to the paths and the necessary and possible time for their vision, a sequence, in the current meaning of the term. I would clarify the different modalities of the sequences of these volumes, coordinated in units, and then the structure of their composition, that is to say type and reason; I would understand the differences between the volumes and the chain of spaces that they form*." The added value of the bay resides in its *dispositio*, not in its autonomous unit. This value is recognizable only when the bay makes up with the others bays, giving rise to a structural pattern, as Moretti says. In order to understand this nature of the bay Moretti made some stone models of famous buildings in which the bay adopts this role. He carved out the void of the empty space of the structure frame, so we can see in his models a sort of negative of the architectural space. So, Moretti focuses on the concatenation of the bays because he sustains that the expressive value is recognizable only when the bay makes up with the others bays, giving rise to a structural pattern. To this end, the main topic in the design of the bay is the void space cut from the structure within the building; the perceptive tension created by an organic system works only in the physical experience of its inner character.

Indeed, the topic of the expressiveness of the bay further radicalizes the relationship between architectural expressiveness and structure looking at the places of production, because of the production processes that imposed to the architect the dimension of standardisation, repetition and economy of means. This approach reduced the distance between architectural form and informal building.

The bay as structural device in Italian reinforced concrete prototypes for the factory

The particular category of reinforced concrete prototypes, built in Italy between 1950 and 1975, embedded a proof of this different design approach. These prototypes regarded a specific type of factory, the single-storey reiterated bay. In those years, the development of prototypes was affected by the adoption of prefabricated structural elements; this phenomenon introduces the problem of spatial modulation in which "the prefabricated system puts into action the bold industrial chain of production and assembly and becomes an architectural work as a prototype of forms expressive figuration"(Pizzetti, 1956). This operative presupposition influences the design process, forcing the designer to identify precisely the structural elements (beams, pillars, deck boards), associable to the tectonic assembly system that guarantees the expressiveness of the concrete shape. The Italian experience shows how the tendency to standardisation and cataloguing of structural elements does not correspond to the disappear of an authorial design, but that on the contrary, it is possible preserve a traditional approach on the design of reinforced concrete component, through a direct encounter with architect, engineer and producers.

It is possible distinguish two-construction categories for the single-storey factories: the first one regards structures based on linear structural elements; the second one regards structures based on form working elements. In the first case the design of structural pattern focuses on the cross section analysis of the elements, forming the framework. Such structures are governed by the principle of tectonic assembly in which each element has a dual nature: it has an autonomous shape that reflects the role of the elements in the discharge of forces; both, at the same time it has a discontinuity that refers to the connection with the others structural elements. In the second case, each element is a frame of a structural continuum, undistinguishable as part of a whole. From a strictly structural point of view, the difference between these two categories is clear: the structures based on linear elements correspond to bending forces, so they are

“inactive structures”; the structure based on form working elements deviate the bending forces, taking advantage from the formwork resistance, so they are “active structures” (Candela,2013).

The bay as a device in the structures based on linear elements for the factory

In the current state of the research, I investigated the first category of single-storey factory: the structures based on linear elements. According to the two paradigmatic interpretations of the bay, that consider the bay as syntagm and the bay as a sequence, it is possible to identify the specific character and the value of six experimental prototypes: (in the figure 1 from the left to the right) the Kodak factory in Marcianise (1971-1975, designed by Aldo Favini and Gianluigi Ghò); the Perugina factory in Perugia(1962, designed by Aldo Favini and Carlo Rusconi Clerici); The Necchi factory in Pavia, (designed by Marco Zanuso); the Olivetti factory in Merlo, (designed by Marco Zanuso); The Olivetti factory in Marcianise; (designed by Antonio Migliasso, Eduardo Vittoria and Marco Zanuso); the Cedis factory in Palermo (designed by Marco Zanuso).

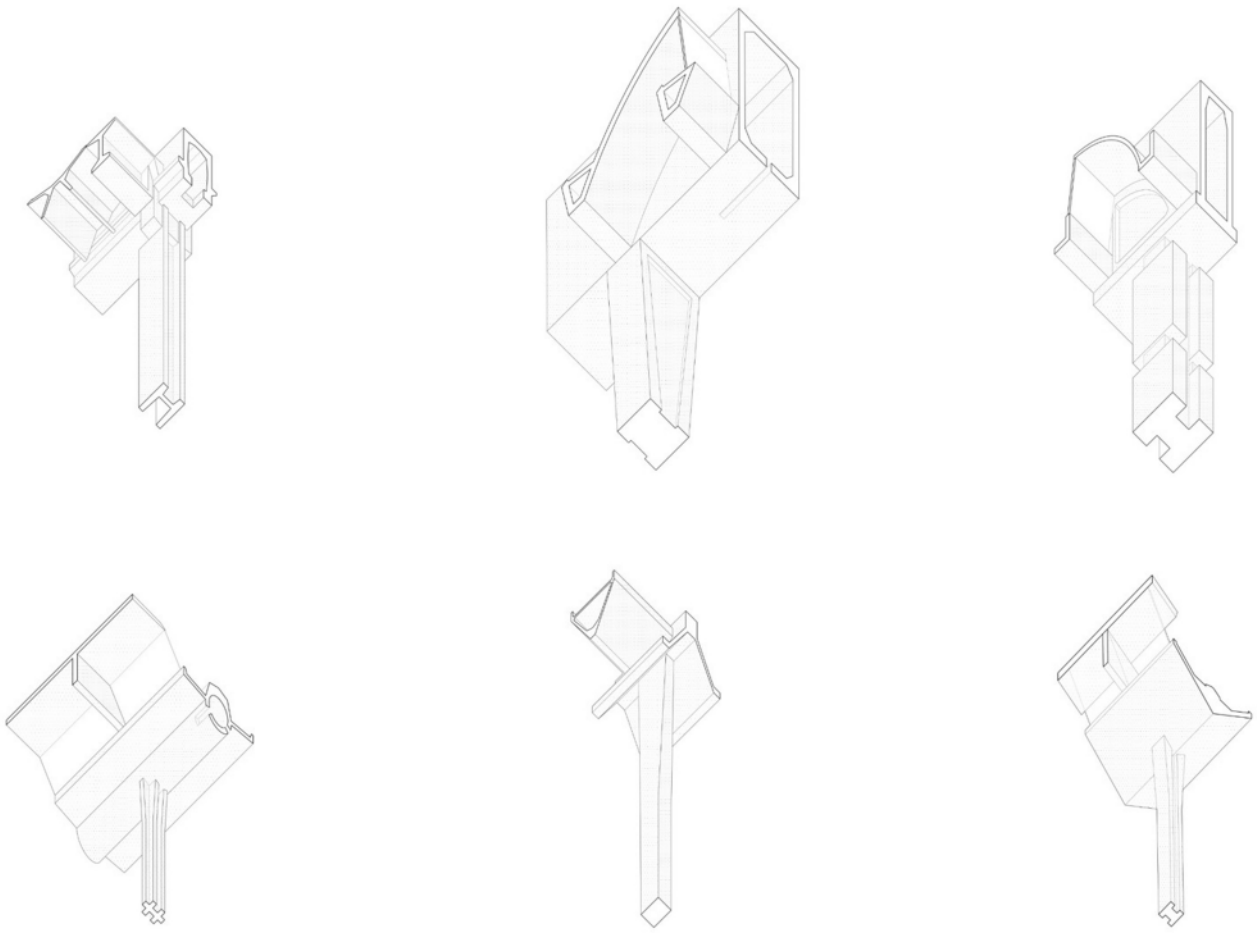

Fig.1 Axonometric view of the pillar-beam-deck device of the case studies, V.Quadrato, 2018

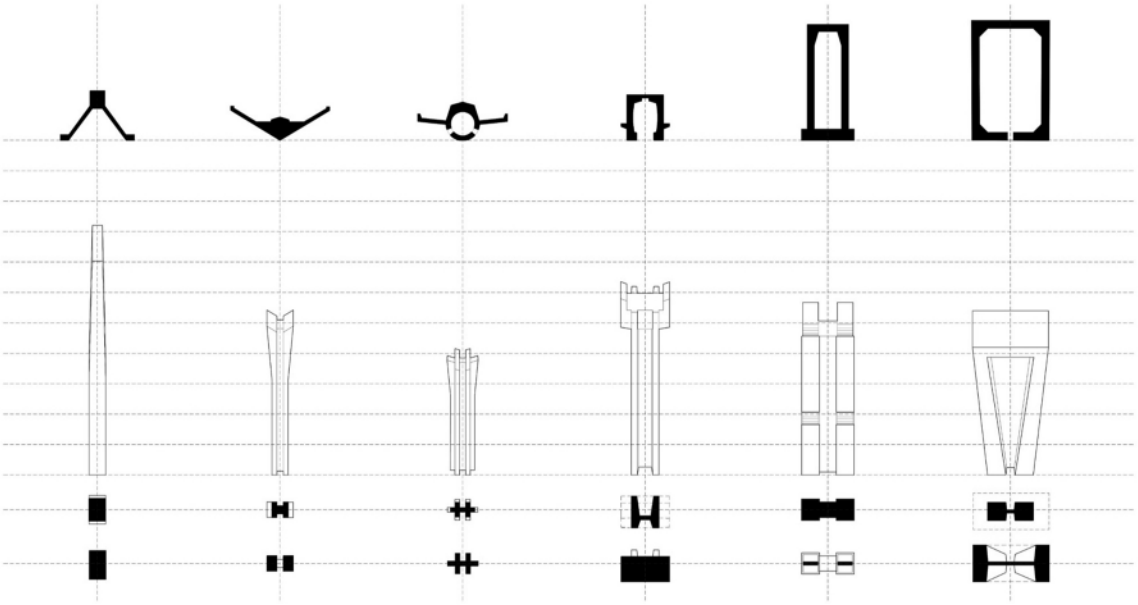

Fig.2 Taxonomy of the pillars and the beams of the case studies, V. Quadrato, 2018

The figure 1 shows the axonometric view of the structural elements of these six factories. We can observe that in all of these cases the structural hierarchy of the bay consists of the relationship between the pillar, the beam and the deck, which relates these building to the classical construction tradition of the trilithic system and the trabeate Form. The definition of these three elements is the founding moment of the design of the factory, because it influences the process of prefabrication that leads to the completeness of the single prototype. The form finding of these elements also influences and are influenced in a metaphoric system of "questions and answers" by the need to provide to the building of the maximum structural span (which in these cases ranged between the 12m and 21m), to simplify the arrangement of the production chain. Another important aspect that influenced this process of Form finding is visible in the taxonomy of the elements (fig.2) and lies with the principle of the material-saving (between fifties and seventies the cost of the concrete has a relevant impact on the general cost of the building) or exploiting the structural resistance section of the elements, eliminating the superfluous. The third aspect cuts to the need to absorb in the thickness of the structural elements the enormous technological system of the industrial building program. Hence, we can observe on the one hand that the pillars tend to enlarge at the top and to restrict downward, outlining a structural joint; on the other hand, the beams tend to present a hollow form in the sectional view that consents to bring inside the cooling water system and the ventilation system.

The figurative results of these practical need are substantial: the structure acquires a significant thickness, its elements provide for an internal void that in some cases hides, in other cases reveals the impressive mass of the technological systems, converting an aesthetic problem in an expressive opportunity for the design process. The figure 3 isolates the structural units of the six case studies, showing the single bays as a ciborium: they appear as autonomous parts of buildings, whose form has guaranteed by the relationship between each elements of the spatial unit. These sorts of ciborium are the focus of the design process of this type of factory, lying with the classical idea of *syntagma*, a combination of elements that forms an autonomous unit of the space. We can observe also the structural hierarchy of the elements: the beam

with hollow section prevails dimensionally on the other frames, embodying the element that determines the longitudinal direction of the space and the structural weave. The deck becomes the giver element of the natural light, carving out the interior space with a continuous or discontinuous system.

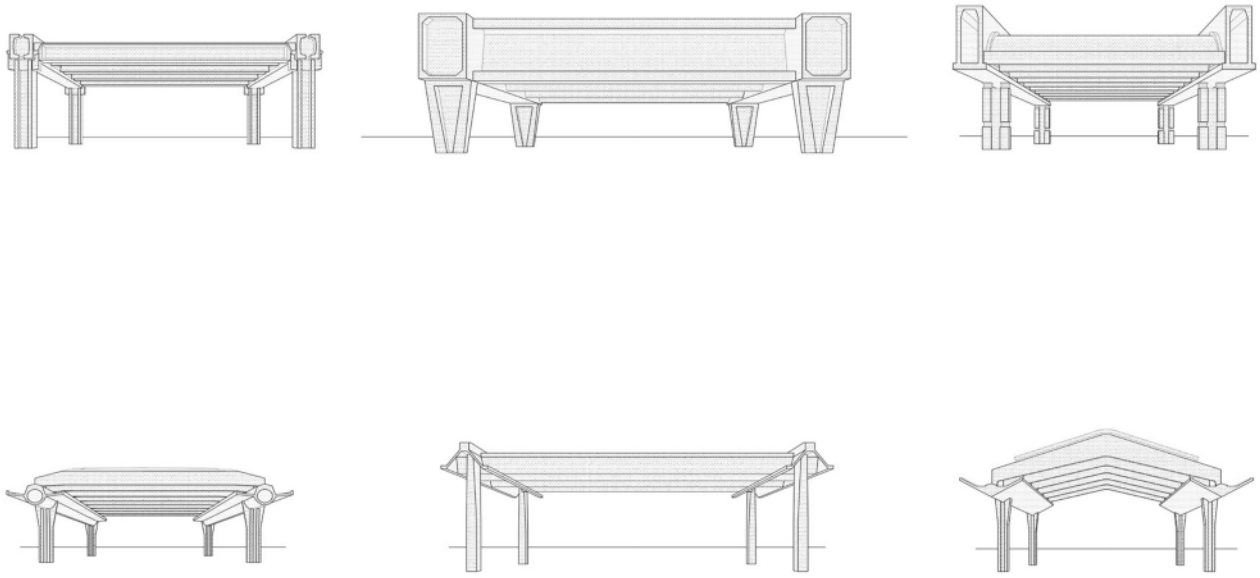

Fig.3 Perspective central view of the structural units of the case studies, V. Quadrato, 2018

The figure 4 highlights on the second key to the interpretation of these case studies, proposed in the previous paragraph, focusing on the idea of the bay as sequence and “expressive concatenation” , as Moretti said. Hence, if on the one hand the bay has an autonomous expressiveness provided by the minimum relationship between the structural elements, on the other hand the bay acquires a deeper meaning through the composition and the disposition of the single units.

A spatial module consisting of the structural span defines the architectural organism, but the direction of the beam with a hollow section determines the structural pattern that lead to understand the character of the interior space. The disposition of the single units sets the bay as a “gallery” that gives to the space a strong orientation and tension, according to a longitudinal direction. This feature is valid for all the case studies, but every project articulates the composition of the bay according to three kind of architectural disposition and hierarchy: the first one is paratactic, or the spatial module is simply one next the other; the second one identifies a center of the composition, an internal court or a volume that organizes the sequence of the structural unit; the third one identifies a principal axis that distributes transversally the sequence of the bays. Once the affected disposition has been determined, the designers proceed to plastic operation to rotation, subtraction or addiction of the bay, according to the functional program of the building.

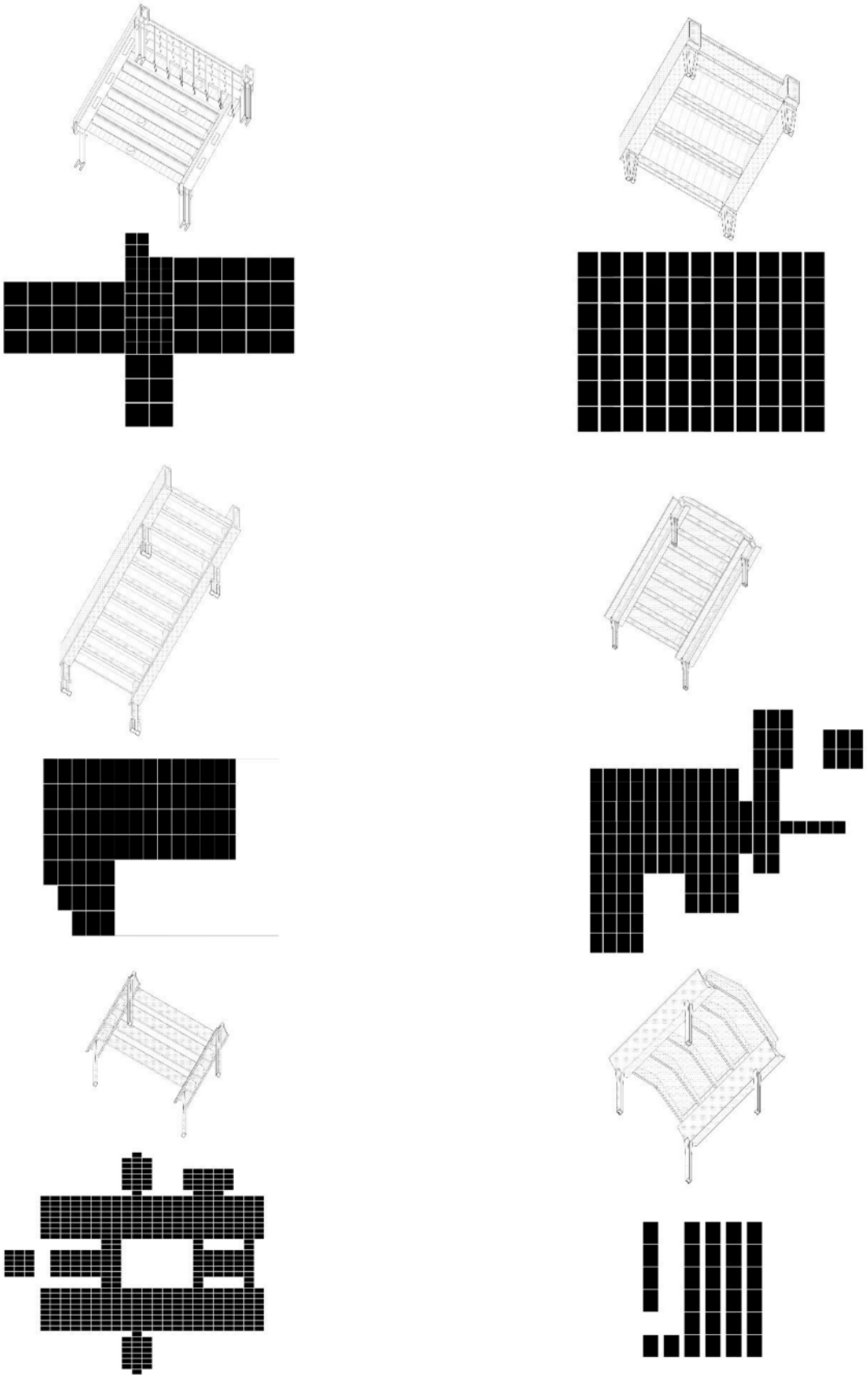

Fig.4 Ideograms on the disposition of the structural units, V. Quadrato, 2018

The bay as the starting point for reusing the factory. Three design strategies for the conversion of the former soap factory in Fasano

The international urban design workshop on the reusing of the disused workspaces, held at Polytechnic of Bari in February 2018, gives to my research group the opportunity to understand how this research can be useful to develop strategies of transformation compatible with the character of the single-storey factories. The former soap factory in Fasano has been chosen as the pilot project area and specific proposals drawn up with the students of the master's degree in architecture at Polytechnic of Bari. The soap factory, the oldest of the still in operation companies, is part of chemical Apulian industries. The factory was built in 1927 and housed the first soap production in Apulia thanks to the great access to olive oil in this area, which it is essential to the manufacturing of the soap. The complex belongs to L'Abbate's family which conducted this business over three generations. The layout of the complex, that exceeds the 4'000 mq, consists of a great fence, 2,50 meters high, constituted by a tufa wall. In the middle of this fenced area there is the real soap factory, which has a structure based on three reiterated bays, as three great longitudinal blocks repeated in a sequence; each bay has 10 meters of structural span, covered by a truss-system. The internal structural arrangement is declared on the façade by a series of three gables. The style of the facade imitates, in certain respects, the examples of basilicas building, according to the habit of the first years of 20th century in Italy for the design of factory: a special attention to the architectonic envelope, in which the designer tries to treat the façade as a monumental architecture, in order to ensure an aesthetic ennoblement to the utilitarian structure. On the inside, the three bays consist of four walls discretized with arcades; this solution consented to create, visually, a whole open space. The coverage of each bay has made by a truss system constituted by a reinforced concrete ceiling, with 10 centimetres of thickness, which is anchored to the truss through steel beams. Each nave was dedicated to a specific production line: soap, detergents and disinfectants. The nave on the left housed the first stage of production and three tanks carved into the soil, in which the soap was mixed.

Thus, if the bay were the most significant character of the space, how would it be possible transform the factory in order to preserve this aspect? We proposed with the students three strategies, adopting the presence of the bay as the starting point for the design of the reusing project. Each strategy welcomed other common choices such as keeping the visual permeability of the interior space, (thus so preserving the direction of the space as a gallery, determined by the direction of the bay), preserving the architectonic envelop of the wall that testifies a specific style of the 20th century factory, eliminating the existing roof, currently in a less than perfect state of conservation. Therefore, all the proposals considered the form of a new roof, as the key to transform the soap factory in a co-working space.

The first project was called "the bay and the inhabited roof" (fig.5) and it started from the possibility to imagine a great coverage system that housed on the inside a series of suspended rooms, consenting to cross freely the space at the ground floor. The timber frame was the structural device that we have chosen in order to create a sort of "beam's weft" which cross transversely to the arcades that define the three bays of the factory. Thus, the roof becomes a sort of typological overlap that takes advantage from the lower arcades as support system; while the new higher floor constitutes a whole unit; the lower floor maintains the logic of a tripartite subdivision of the space. The inside layout provides for the localisation of the stairs and services across the existing walls, creating a double-walled system.

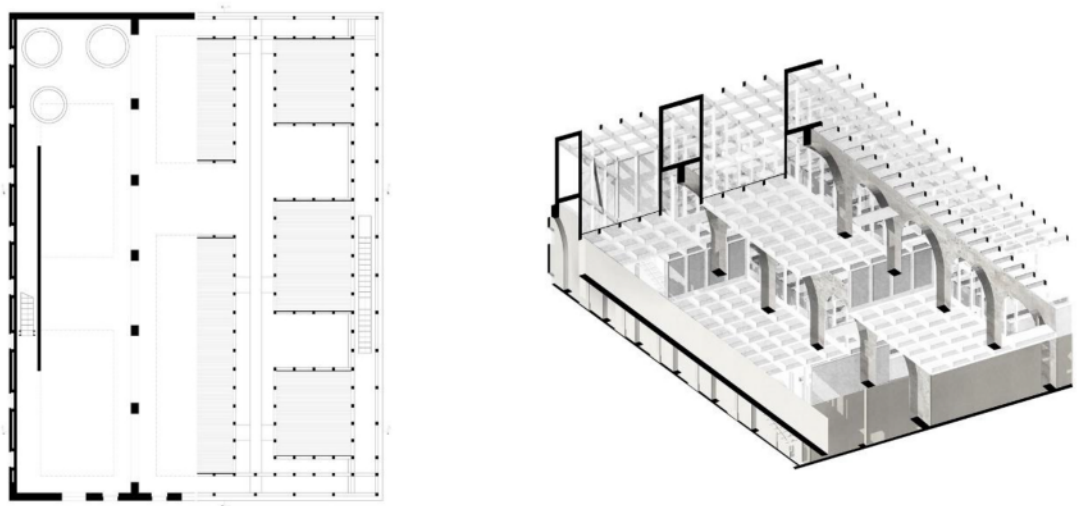

Fig.5 The bay and the inhabited roof, students: Maddalena Colonna, Antonia Valeria Di Lauro, Remo Pavone, Aldo Pisanello, Tutors: Michele Montemurro, Antonio Nitti, Vito Quadrato, Francesco Protomastro, Nicola Selvaggio, 2018

The second project was called “the bay and the sequence of rooms”, (fig.6)working on the idea that the form of the roof can mark a unit of the space, such as a room. The structural choice provides for a series of reinforced concrete pyramid-shaped shell, placed as a “suspended enfilade” which defines through the coverage system a part of the bay with different facilities, creating in the longitudinal sectional view a sort of compression and decompression of the space. The structural span of these shells accords to the ten meters of the bay, and the coverage system becomes the giver of the vertical light. A flexible system of curtains hanged to the shells permits to combines the rooms respect to the change of needs.

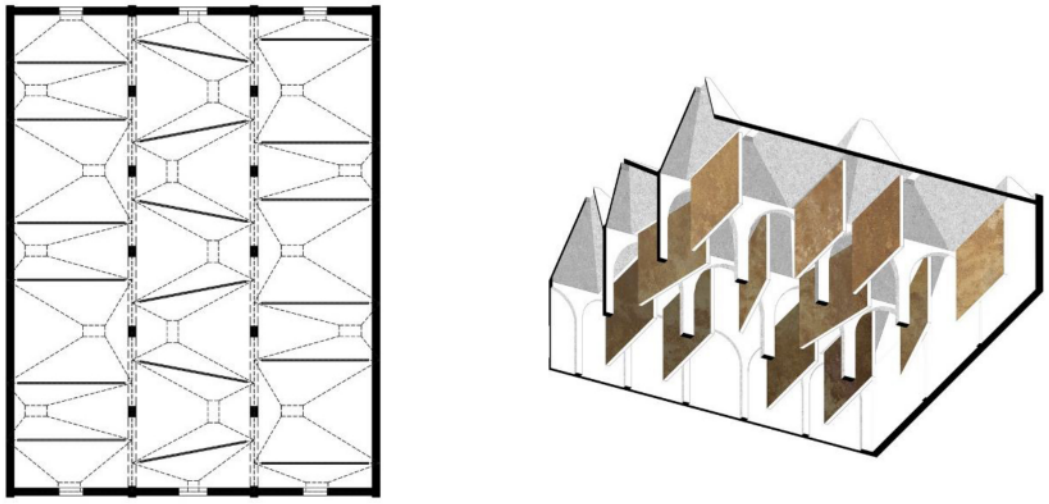

Fig.6 The bay and the sequence of room, Students: Floriana Cavallo, Domenico Cristofalo, Nicoletta Derosa, Roberta Gaetani, Giovanna Moccia. Tutors: Michele Montemurro, Antonio Nitti, Vito Quadrato, Francesco Protomastro, Nicola Selvaggio, 2018

The third project was called “the bay and the beams”, (fig.7) working on the idea of four great continuously supported beams, that maximises the longitudinal sense of the space, like the Marco Zanuso’s Cedis factory. These beams are V-shaped and relies upon the arcades as a system that responds to the lighting need and the water drainage. A series of platform, with the longer side in parallel with the sense of the bay have been hanged to the beams, C-shaped in the cross sectional view. The system of connection between the lower and the upper floor was placed between the platforms and the arcades, allowing to link the platforms each other through some crossing passages.

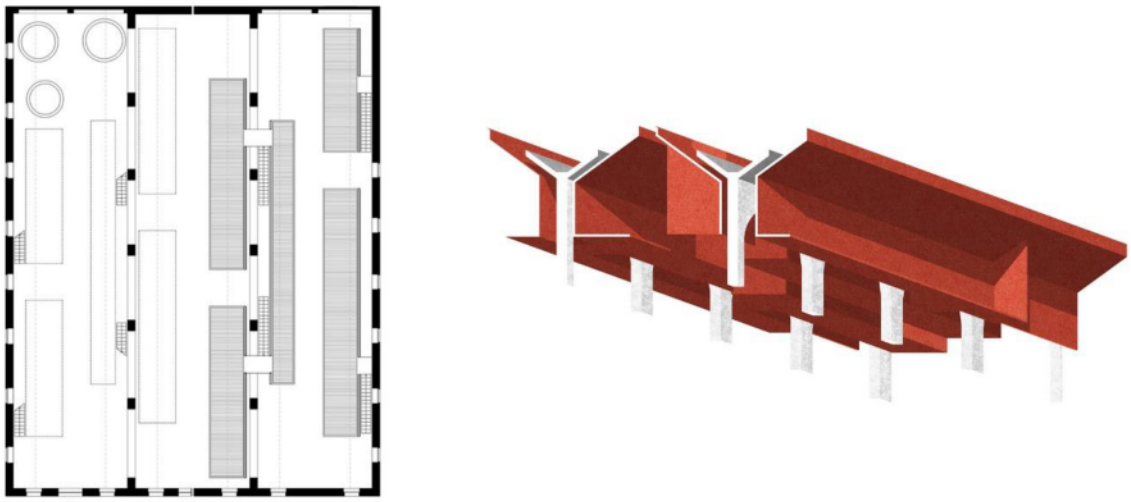

Fig.7 The bay and the beams, Students: Maria Giovanna Gassi, Walter Lollino, Nicolò Montuori, Giancarlo Sgaramella Tutors: Michele Montemurro, Antonio Nitti, Vito Quadrato, Francesco Protomastro, Nicola Selvaggio, 2018

The critic and theoretical research on the reinforced concrete prototypes for the factory shows how the structural design can make a meaningful architectural space. The understanding of the relationship between the structure and the space seems to be a focal point especially for the single-storey factories, in which the construction guarantees the expressiveness of the building, thus so the aspect that permit us to include some industrial examples as a part of historical heritage and permit to understand the design strategies for an adaptive reuse, respectful of the character of the space.

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WEAKNESS AS MODE OF OPERATION

KARIANNE HALSE

Weakness as Mode of Operation

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abstract
This paper seeks to unfold the spatial and generative potentials of weakness in the development of architecture and theory, and as a creative driver in artistic- and architectural research.

Weakness is a term which usually comes with negative connotations. The paradox and ambiguity of this term is intriguing. Unfolding the subject, weakness conducts vital tasks – and in some cases even is what makes a system 'strong' and resilient.

The paper discuss weakness from theoretical perspectives and through specific identified examples of systems with an embedded weakness. Weakness will be unfolded through these on-going investigations ('Demonstrations') and a vocabulary of operational terms (index-cards).

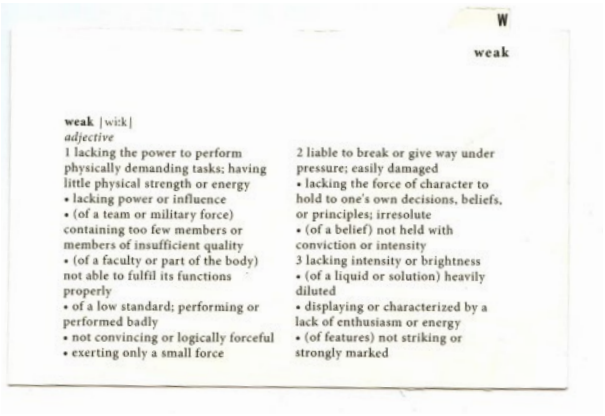
The concept of weakness proposes dynamic relationships and emerging capacities and - through fragmentation and assemblage - composing realities without reducing to one synthesis. Ultimately with an aim to provide more stratified conceptions of architecture.

The overall research project, *'Weakness in Architecture; Changing Spatial Environments and Tectonics'* (2017-), is in the early stage, and investigates how weakness can foster a dynamic relationship between architecture and environmental forces and processes.

weakness
Weakness is a term which usually comes with negative connotations (index card, ***weak***). In the dictionary, the term is described as 'lacking the power to perform physically demanding tasks,' not able to fulfil its functions properly,' and 'of a low standard.' However, in the field of biology, *weak bonds* are vital. Most of the molecules which are essential for life have many interchangeable elements, which would demand too much energy to rearrange if they were strongly bonded. An example of this is the weak hydrogen bonds, which help determining and stabilizing the shapes of biological molecules.[1]

The philosophy of weakness derives from Gianni Vattimo's theories of *'weak thought'* (pensiero debole).[2] The theories is Vattimo's proposal for a philosophy of postmodernity, against a globalizing model based on truth, unity, and totality. The basic premise of this theory is the idea that there is no longer possible to pursue a complete, stable, metaphysical truth, and instead one must rely on a hermeneutical truth - which is interpretative, partial, and provisional.[3]

In an architectural context, the concept of weakness has been used as a response to modernism, claiming 'the necessity for a philosophy denying any kind of strong, definitive and universal solution.'[4] Based upon Vattimo's 'weak thought,' the architect and theorist Andrea Branzi further developed these principles into weak urbanisation. According to Branzi, the concept of weakness follows a more natural logic than the geometrical, as it 'proceeds following more incomplete, imperfect, disarticulated types of cognizance and transformation.'[5] This weak concept is not seeking one definitive and universal solution of architecture, and 'renounce the final state of stable perfection.' [6] Instead, it proposes more *fragmented* and *heterogeneous scenarios*, where the unexpected is valued.


W
weak

weak |wiːk|
adjective
1 lacking the power to perform physically demanding tasks; having little physical strength or energy
• lacking power or influence
• (of a team or military force) containing too few members or members of insufficient quality
• (of a faculty or part of the body) not able to fulfil its functions properly
• of a low standard; performing or performed badly
• not convincing or logically forceful
• exerting only a small force
2 liable to break or give way under pressure; easily damaged
• lacking the force of character to hold to one's own decisions, beliefs, or principles; irresolute
• (of a belief) not held with conviction or intensity
3 lacking intensity or brightness
• (of a liquid or solution) heavily diluted
• displaying or characterized by a lack of enthusiasm or energy
• (of features) not striking or strongly marked

scan, index card

The overall research project investigates how weakness can foster a dynamic relationship between architecture and environmental forces and processes.

In an age in which architecture has become increasingly image-based, the ideal state of a building is often conceived as immediately after being built and still appears as it was drawn. According to the philosopher Gernot Böhme, 'the representation of the work in photographs has become just as important as, if not more important than, the building itself.'[7] Considerable resources are used to counteract wear and tear - *working against* environmental forces and processes (entropy) - to maintain the building as this ideal static image.

assemblage

Theories of weakness are utilised to make a shift from the notion of buildings as fixed objects, to something which includes less stable and fixed notions of architecture. Furthermore, the project investigates how weakness could provide expanded margins for negotiation with forces and uncertain future circumstances. Contemporary theories of *New Materialism* share a similar approach as Vattimo's 'weak thought,' and moreover, provide a framework to transcend binaries of *nature-culture* - envisioning scenarios where the boundaries between the natural world and the built environment are ambiguous. Through these theories, the project seeks to compose and intervene in a more complex reality. Architecture and its environment are approached as an *assemblage*[8] which acts as a series of (intentionally) changing spatial conditions over time - generating changing experiences related to space, time and phenomenological effects.

The concept of assemblage is a mode of ordering heterogeneous entities so that they work together *for a certain time*. The aspect of time is essential. It underlines that assemblages are not fixed or permanent compositions, but are rather 'caught up in a dynamic of *deterritorialisation* and *reterritorialisation*.'[9] The assemblage implies dynamic relationships and emerging capacities which is particular operational for this research project, as it does not seek one ideal final synthesis. Assemblage theory suggests a more fragmented and open-ended way of approaching architecture and its environment – and furthermore introduces a generative way of operating, which supports a weak theory construction and overall 'weak' methodology.

The overall research project is centred around the development of a set of '*Demonstrations*' (practice-based investigations) and a *vocabulary of operative terms* (index cards, weak theory construction).

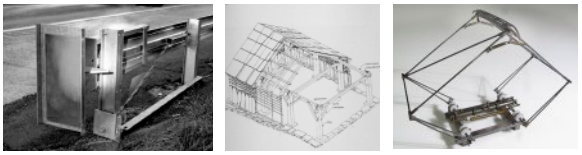
demonstrations

The point of departure is a collection of existing examples of systems with *an embedded weakness,* which provides a direct (intentional) response to external impulses. These examples derive from various fields, from architecture (vernacular building technologies), traffic and transportation engineering to smaller devices and components. In some of the examples, the weakness is the component, where that part is potentially sacrificed to protect more valuable parts of the system. In other cases, the links between the components are weak to enable transmission of forces.

[galvanic anode] *[parge coat]* *[sprinkler fuse]*

[circuit breaker] *[venice]* *[hurricane break-away walls]*

[seismic design] *[icelandic highway system]* *[floating pontoon]*



[guardrail] *[stave construction]* *[pantograph]*

examples with an embedded weakness

The examples are investigated through a set of experimental (artistic) and analytical operations, which serves as a way of *de-contextualising* the specific examples and unfold latent spatial architectural potentials across scale, purpose, and context. These operations act investigative and generative – as sort of *thinking-devices,* inventing questions through the act of making. And potentially lead to further architectural speculations that are detached from the original context of the example.

Emerging from dialogues and oppositions of the examples, three different Demonstration*s* have been initiated and developed in parallel. This way of operating is *unfolding the field*, where points of references are established which can form new and diverse categories of architectural potentials. The drift between the Demonstrations is used productive, unfolding and initiating different perspectives of time (cyclical – linear), reaction (instant – gradual), tectonic qualities, and spatial layouts.

Material from two of the Demonstrations is included in this paper:

DEMONSTRATION #1 derives from the example of a [1] *circuit breaker* (in an electrical system). The device performs an instant reaction when detecting an electrical overload, and weak links allow a magnet to pull down a lever and to cut the circuit. These initial investigations have revealed aspects as *choreography*, *event,* and temporal perceptions of *suspense* and *surprise*, which directs further investigations.

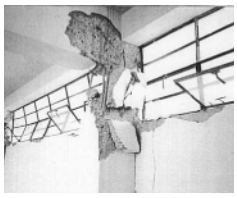
(page 4-5)

[1]

DEMONSTRATION #3 is based upon a set of examples, which have in common an anticipation of failure and control of destruction. The examples are a [2] *protection panel* (in a bus) – where engravings in the plastic surface control how it fractures – and principles of weak points from [3] *seismic design* and [4] *the Icelandic Highway system*.[10] In both of these two examples, forces are directed to certain spots which are designed to break, dissipating some of the energy and thereby saving rest of the structure. From these examples, the principles of *generative destruction* is the point of departure for the following investigations (on-going).

(page 6, 8)

[2]

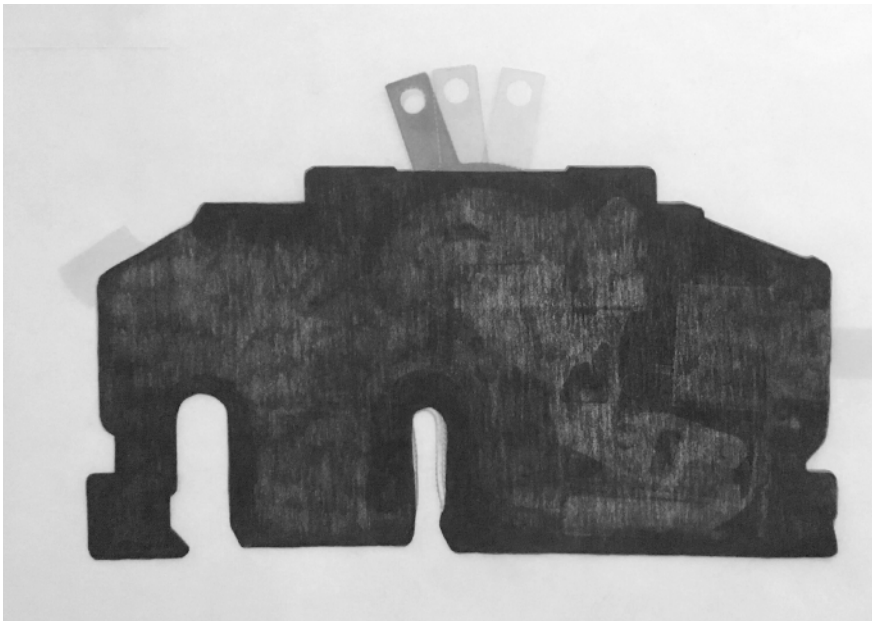


[3]

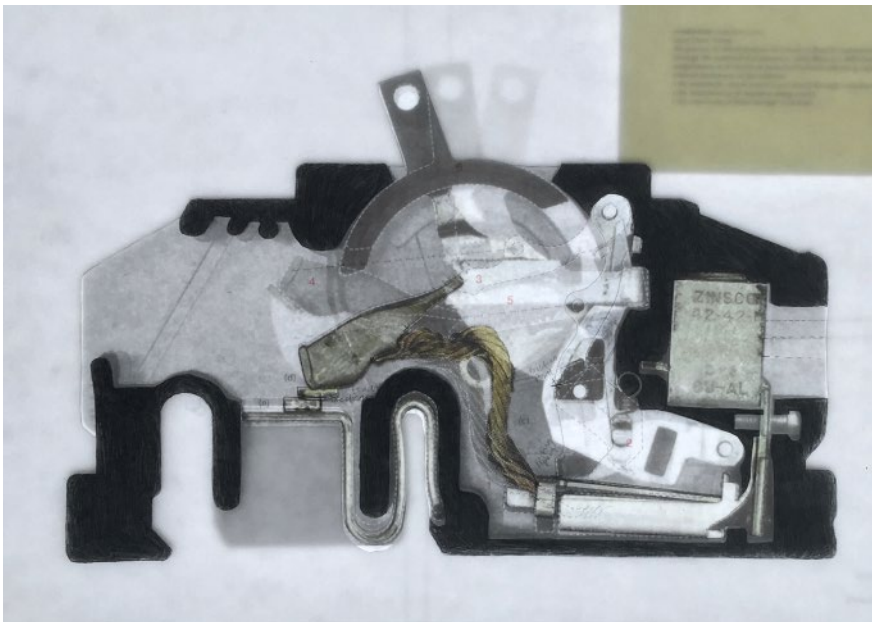
"We know when we build a bridge it will not last."

– representative from the Icelandic Road Administration, May 5, 2012

[4]



[1]

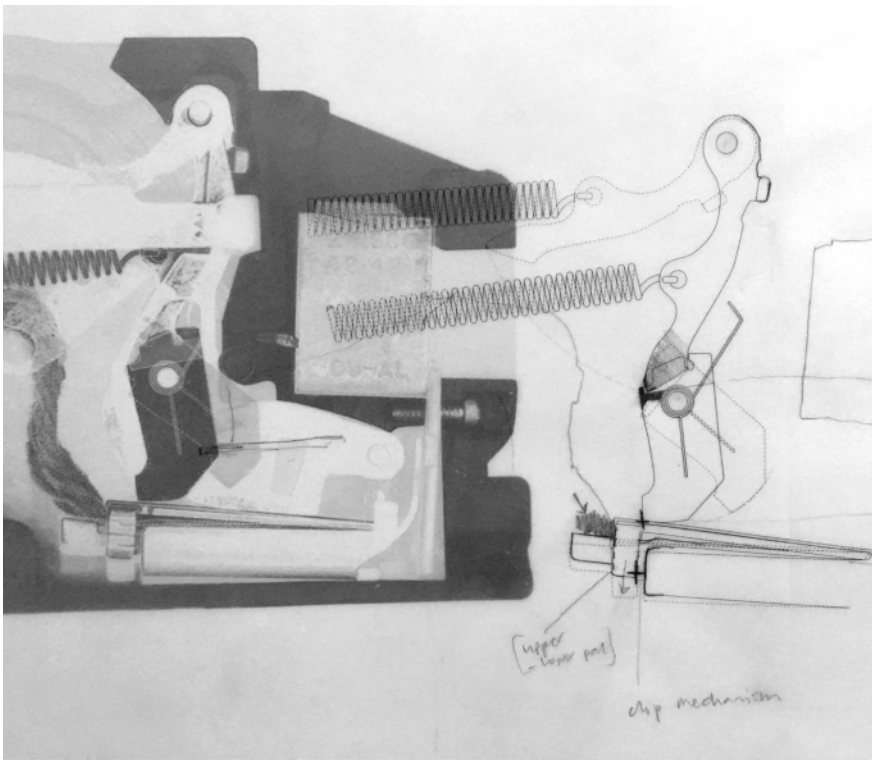


[2]

[graphics]
Corresponding layers of drawings and written paragraphs (manual) – providing a sequential reading of the device through the layers and paragraphs. A *manual of the architectural reading of the device*.

(this page) circuit breaker, drawing, selection of layers

(next page) manual, selection of paragraphs



[5]

[M A N U A L] *of Demonstration #1: circuit breaker*

'[…] this invention resides in the combinations, arrangements and functional relationships of elements, as set forth in the following specification […].'

Patent document: United States Patent Office, 2,502,537 Circuit Breaker.
Serial No. 62,045, Apr. 4, 1950

1.
Circuit making and breaking

Hidden behind a cover of thin plastic sheet reside two interrelated systems - an electrical and a mechanical. The only parts visible, revealing hints of the inner life of the device, is glimpses of an operating switch and a contact point – which further indicates a relationship to something outside.

When the components within are placed in correct positions, electricity flows through the closed circuit of the device. This flow of electricity connects the device and the individual building to an even larger electrical network of cords and cables, to neighbourhoods, cities, and further on. [1]

2.
Insulation

A moulded body of an insulating compound defines the spatial delineation of the device. The spatial organisation of movable components is made of confined spaces/areas with a pre-defined freedom of movement, ensuring appropriate relation between parts. Space of possible states. [2]

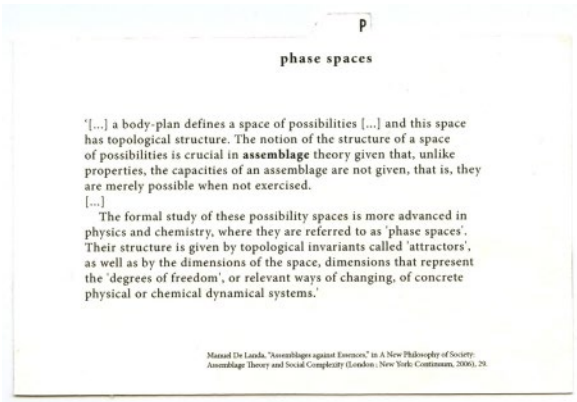
5.
Event

The circuit breaker provides an instant reaction to electrical overload. When detecting an overload, the mechanical components performs a predefined choreography - order of steps. This sequence culminates with an event - breaking the circuit and cutting the electricity. This movement is pre-orchestrated; the components are triggered and leads to the next movement of the component nearby. A succession of devices or stages in a process, each of which triggers or initiates the next. [5]

6.
Temporal perception

The performance is carried out behind the cover. It is unknown when it will happen - but the line of action is foreseen. An inherent tolerance within the device where minor changes/ deviations are not detectable, until the overload just passes the tipping point and triggers the first component in the 'set up'.

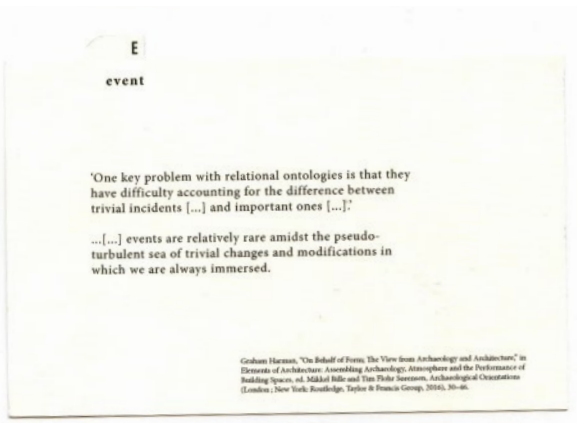
The system of the device is reversible –a cyclical aspect of time cyclical. The breaker is reset by pushing the operating switch, which repositions the components and re-creates connection/circuit. [5]


P

phase spaces

'[...] a body-plan defines a space of possibilities [...] and this space has topological structure. The notion of the structure of a space of possibilities is crucial in **assemblage** theory given that, unlike properties, the capacities of an assemblage are not given, that is, they are merely possible when not exercised.
[...]
The formal study of these possibility spaces is more advanced in physics and chemistry, where they are referred to as 'phase spaces'. Their structure is given by topological invariants called 'attractors', as well as by the dimensions of the space, dimensions that represent the 'degrees of freedom', or relevant ways of changing, of concrete physical or chemical dynamical systems.'

Manuel De Landa, "Assemblages against Essences," in A New Philosophy of Society: Assemblage Theory and Social Complexity (London ; New York: Continuum, 2006), 29.

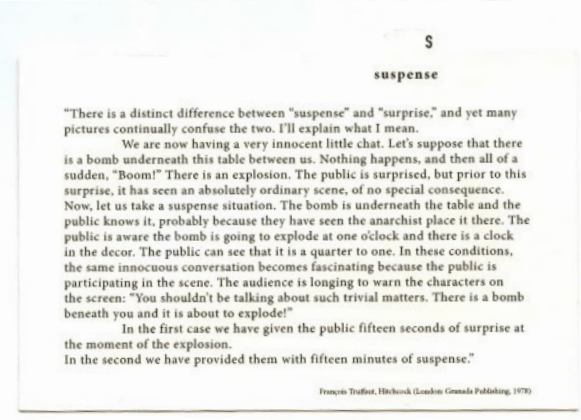

E

event

'One key problem with relational ontologies is that they have difficulty accounting for the difference between trivial incidents [...] and important ones [...].'

...[...] events are relatively rare amidst the pseudo-turbulent sea of trivial changes and modifications in which we are always immersed.

Graham Harman, "On Behalf of Form, The View from Archaeology and Architecture," in Elements of Architecture: Assembling Archaeology, Atmosphere and the Performance of Building Spaces, ed. Mikkel Bille and Tim Flohr Sørensen, Archaeological Orientations (London ; New York: Routledge, Taylor & Francis Group, 2016), 30–46.


S

suspense

"There is a distinct difference between "suspense" and "surprise," and yet many pictures continually confuse the two. I'll explain what I mean.
We are now having a very innocent little chat. Let's suppose that there is a bomb underneath this table between us. Nothing happens, and then all of a sudden, "Boom!" There is an explosion. The public is surprised, but prior to this surprise, it has seen an absolutely ordinary scene, of no special consequence. Now, let us take a suspense situation. The bomb is underneath the table and the public knows it, probably because they have seen the anarchist place it there. The public is aware the bomb is going to explode at one o'clock and there is a clock in the decor. The public can see that it is a quarter to one. In these conditions, the same innocuous conversation becomes fascinating because the public is participating in the scene. The audience is longing to warn the characters on the screen: "You shouldn't be talking about such trivial matters. There is a bomb beneath you and it is about to explode!"
In the first case we have given the public fifteen seconds of surprise at the moment of the explosion.
In the second we have provided them with fifteen minutes of suspense."

François Truffaut, Hitchcock (London: Granada Publishing, 1978)

scan, index cards

index cards

The vocabulary of operative terms is built up throughout the research project, and creates a vertical movement across. The terms are unfolded through neutral definitions and/or theoretical positions, and are organised as individual index cards that act as a dynamic tool of *theoretical fragments*.

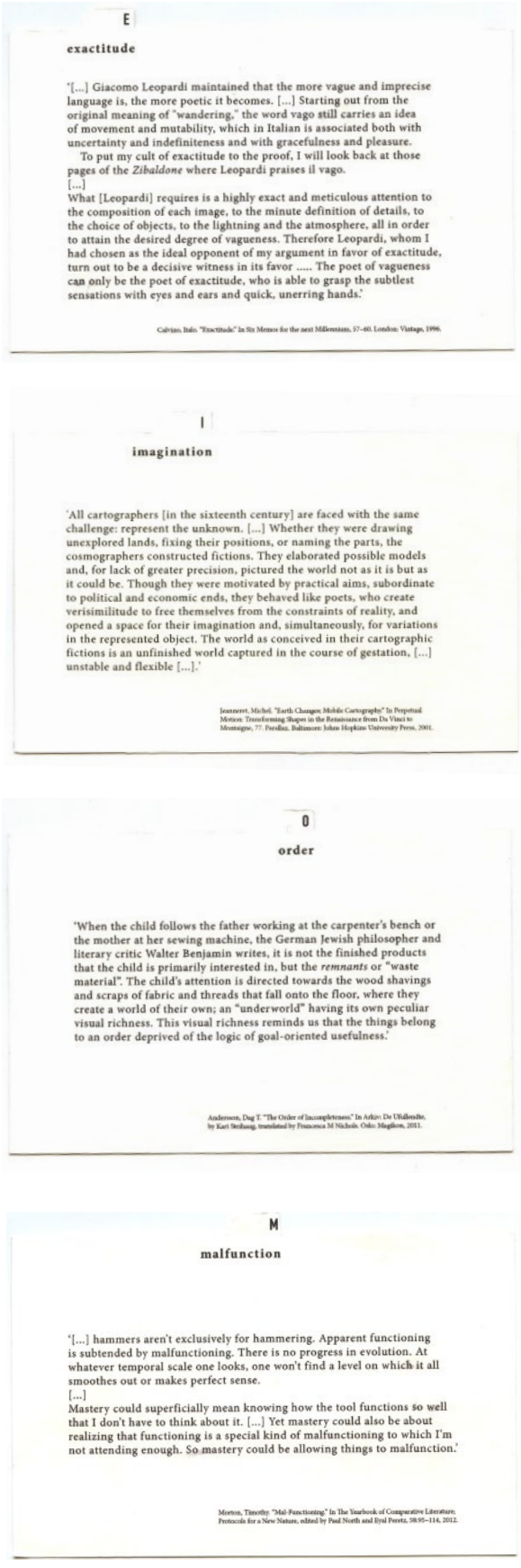
The index cards give theory a physical and tangible presence. At the moment, four cards embody the essence of the overall research project. (index card, ****exactitude *imagination *malfunction *order***). The selection of these four cards are continuously considered – and some (or all) of the cards might be replaced. To make this selection requires an active positioning and take a standpoint. The mentioned cards give an intrinsic feeling of capturing something essential. Without being able to grasp the full meaning at the given moment, the cards act as a core which directs further formulations.

The vocabulary transcends boundaries, and generate previously unseen connections across relevant disciplines as geology, mechanics, art, philosophy, etc. This provides a broader understanding of a given term as well as pointing out possible angles and raises questions which are further addressed in the practice-based experiments. Furthermore, the index cards create relations between terms, as a card might refer to other terms and cards. An example of this comes from DEMONSTRATION #3 which took its departure from the index card 'destruction', leading to a succession of terms and cards, revolving around the notion of *order*. (next page: index cards, ****destruction, *order, *entropy, *entropy***).

The act of selecting quotes and determining terms is driven by intuition.[11] In general, terms are chosen to capture the essence of a quote, and secure relation to other terms. Analysing the working process so far, there is a tendency that an (operational) friction has been of interest and directing some of the choices. Examples are relevant terms which come with negative connotations, but a closer look at the definition or a different theoretical context suggests a more positive comprehension of the term. Or theoretical positions which are filed under a term which differs from the way it conventionally would be described - as with the term 'exactitude' (index card, ****exactitude***). Some terms have several index cards and definitions, where some are even conflicting. This productive ambiguity provides a vocabulary of nuances and alternative perspectives, which complement more stratified conceptions of architecture.

The dynamic and operational use of the index cards is situated within a *weak theory* discussion, initiated by Sedgwick (1997) with the field of social science, and further developed by Stewart (2008) and Pétursdóttir and Olsen (2017).[12] Weak theory is mobile and open for modification and provides a space to be moved by other theories and practice-based experiments. According to Stewart, weak theory construction is in contrast to a "paranoid" or "strong" theory, which 'defends itself against the puncturing of its dream of a perfect parallelism between the analytic subject, [the] concept, and the world.'[13]

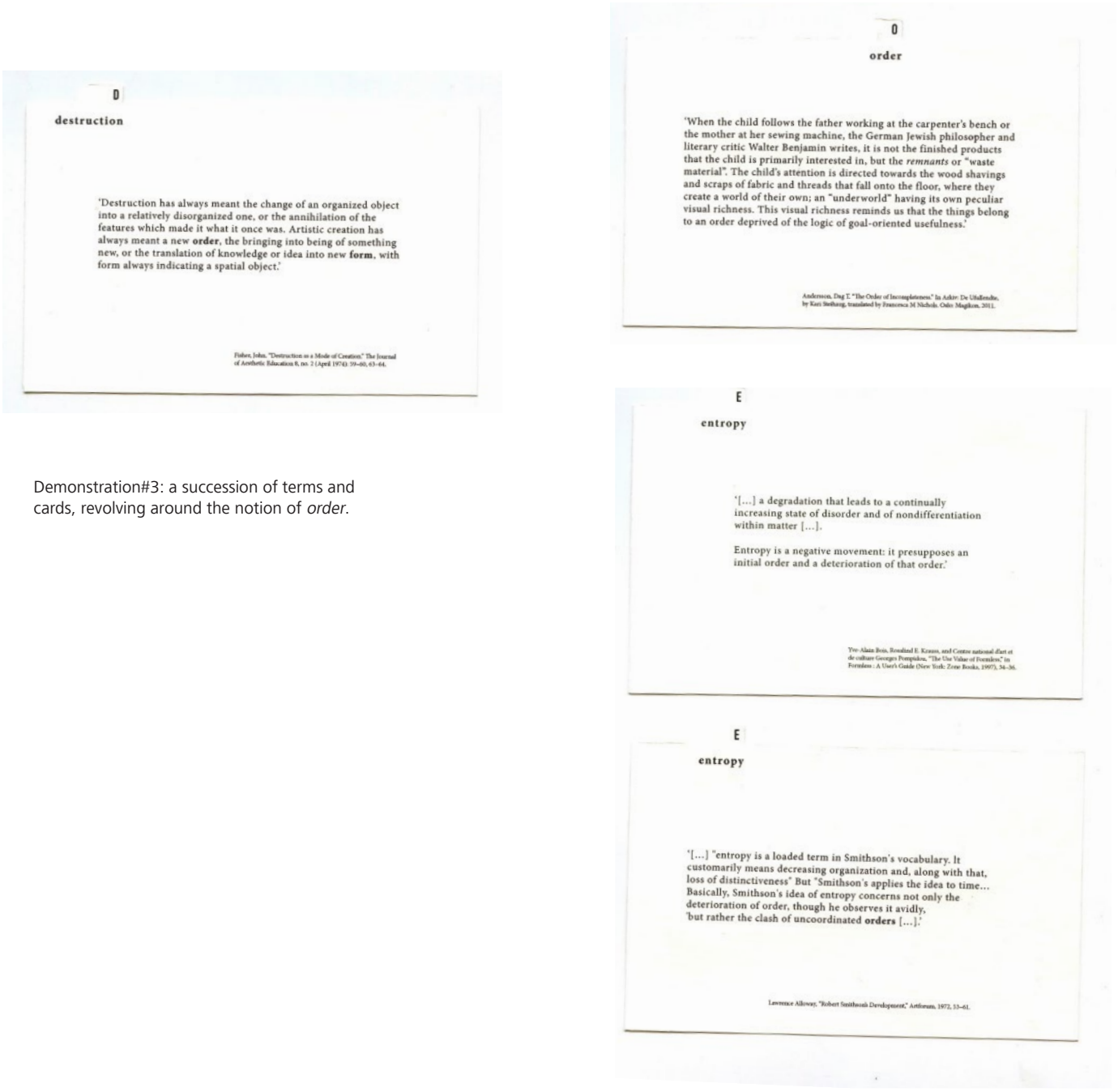
A similar approach is formulated by Jonas Redstrøm,



scan, index cards

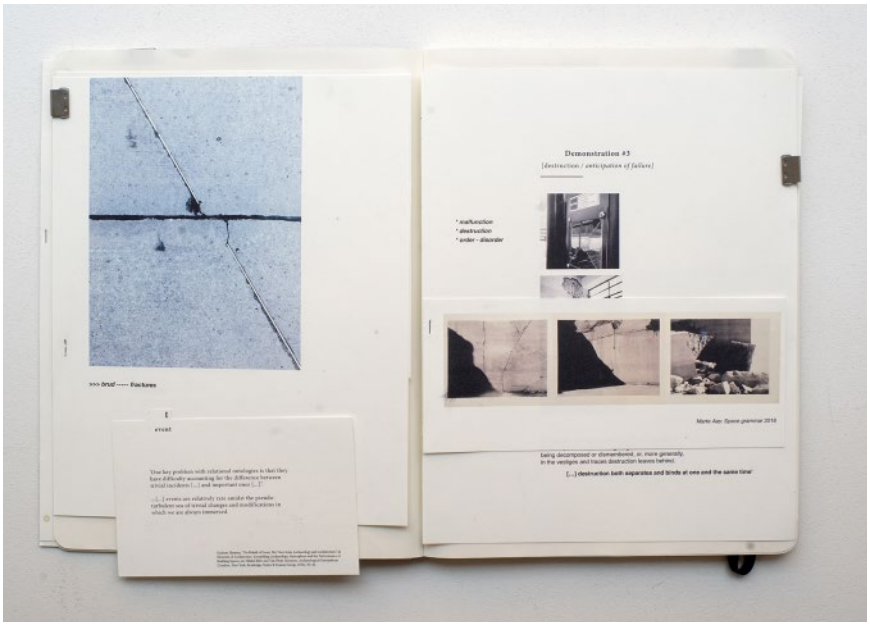
which has a particular attention to theory development in design research. In his approach, theory is considered one of those things design research engages in making, equal to all the other formats of things being made. He defines it as *'transitional theory*,' which unlike most theories at the same time is something 'fluid, unstable, and transitional.[14] Through this approach, quoting Redstrøm, theory is

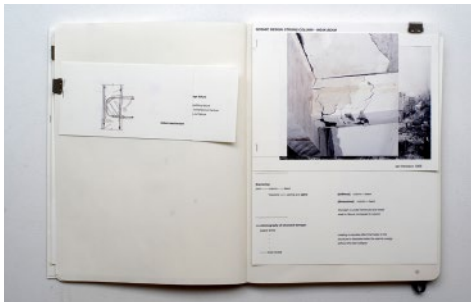
'not used only to account for existing things but also importantly to imagine things not yet seen.[15]



Demonstration#3: a succession of terms and cards, revolving around the notion of *order*.

scan, index cards





Assemblage, moleskin. Demonstration #3

intermediate–level knowledge

The various fragments of different media and techniques, such as layers of images, computer- and hand drawing, index cards of terms, paragraphs of written text, material components, et cetera are continuously re-worked and re-arranged as assemblages. The relationship between fragments creates a *space of possibilities*, which poses questions and making preliminary connections. A drawing which belong to a line of investigations in one Demonstration, would also directly confront and question investigations in a different Demonstration. Or, at times, discoveries are implemented across Demonstration boundaries.

This working method facilitates an intuitive and experimental way of operating, which allow one to jump between fragments and follow trajectories. The fragments act as a sort of *anchor points,* which provide a structure to navigate within.

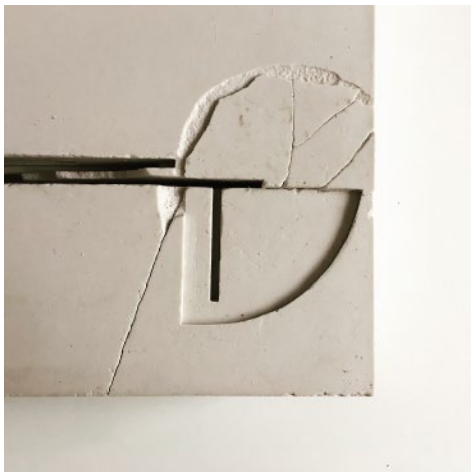
This operative in-between stage, which occupies the territories between the examples and speculations, can be perceived as *intermediate-level knowledge*. [16] It is more than the original example but is still not an independent architectural speculation. Quoting Gaver and Bowers, it is

'a way of modestly and speculatively reaching out beyond the particular without losing grounding—and doing this with all the rigor and relevance needed to inform the invention and detailed development of new designs.'[17]

Throughout the research project, a question has emerged on how to assemble the fragments. A digital assemblage has limitations, as some relations require layering and overlaps which reveals parts of fragments underneath. Furthermore, the various possibilities of sequencing and unfolding, allowing a closer look at a detail, while keeping an overview favour the physical assemblage - still being able to identify the individual fragments of the assemblage, and keeping the possibility to rearrange.

The current status is printed fragments, assembled in a *moleskin notebook* (19 x 25 cm). Printing the fragments implies some basic, but important decisions, as size of the fragments, paper quality (transparent, translucent, thickness), and how to combine and unfold the material. Another aspect for further consideration is how to physical construct assemblages between fragments of different media and sizes, without reducing to graphical representations.

'[...] there is no such thing as formless matter, but you are still interested in being able to distinguish between ***more and less organized forms*** as well as more and less ***stable forms***.'[18]



Demonstration #3: material fragments

closing commentary

As mentioned, the research project is in its early stage (7 months into the PhD studies), and the material presented acts as stepping stones for further speculation. This paper, hence, acts as a way of encountering what has already been made to direct a path for further investigations.

The project and this paper is a start of an ongoing discussion of how to navigate in the field of uncertainty, both when It comes to architectural research and architecture itself - *balancing the planned and the chance.* The concept of weakness is not seeking one definitive and universal solution of architecture, proposing more *fragmented* and *heterogeneous scenarios*.

Weakness as a mode of operation acts as a creative driver, transcending boundaries and potentially generates previously unseen connections, alternative perspectives, and speculations.

acknowledgments

The author would like to express her gratitude to The Danish Council of Independent Research for funding this PhD fellowship.

endnotes

1 G. R. Desiraju and Thomas Steiner, *The Weak Hydrogen Bond: In Structural Chemistry and Biology*, International Union of Crystallography Monographs on Crystallography 9 (Oxford ; New York: Oxford University Press, 1999).

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3 Pablo Martínez Capdevila, "Towards a Weak Architecture: Andrea Branzi and Gianni Vattimo," *Cuadernos de Proyectos Arquitectónicos*, no. 6, Diálogos Cruzados/Antagonismos (2016): 147–50.

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9 Martin Müller, "Assemblages and Actor-Networks: Rethinking Socio-Material Power, Politics and Space," *Geography Compass* 9, no. 1 (2015): 27–41.

10 Gudmundur Gudmundsson, "Bridge over Jökulsá á Fjöllum – When Is a Glacial Flood Too Large to Design For?," 2016.

11 The Bergsonian understanding of intuition is 'directly linked with experience. This is different from the more passive meanings of the word that denote automatic and responsive action. According to Bergson intuition is *knowledge in action:* the direct and willed perception of reality, and a method of doing and thinking in tune with the flow of events.'

Yeoryia Manolopoulou, "Drawing as Event," in *Architectures of Chance*, Design Research in Architecture (Burlington: Ashgate Publishing Company, 2013), 116.

12 Þóra Pétursdóttir and Bjørnar Olsen, "Theory Adrift: The Matter of Archaeological Theorizing," *Journal of Social Archaeology* 18, no. 1 (February 2018): 97–117

13 Kathleen Stewart, "Weak Theory in an Unfinished World," *Journal of Folklore Research* 45, no. 1 (2008): 71–82.

14 Johan Redström, "Thing and Theory," in *Making Design Theory*, Design Thinking, Design Theory (Cambridge, Massachusetts: The MIT Press, 2017), 6.

15 Johan Redström, "Transitional Theory," in *Making Design Theory*, Design Thinking, Design Theory (Cambridge, Massachusetts: The MIT Press, 2017), 136.

16 Jonas Löwgren, "Annotated Portfolios and Other Forms of Intermediate-Level Knowledge," *Feature*, no. interactions (2013): 30–34.

17 Bill Gaver and John Bowers, "Annotated Portfolios," *Interactions* 4, no. 19 (2012): 40–49.

18 Index-card: 'formless'. Graham Harman. "Realism and Materialism." In *The Rise of Realism*, 1–25. Cambridge, UK: Polity, 2017.

SUBSTANTIATING LINES: THREADS, FOLDS & TRACES

CORNEEL CANNAERTS

SUBSTANTIATING LINES: THREADS, FOLDS & TRACES

Dr. Ir. Arch Corneel Cannaerts, KU Leuven Faculty of Architecture, Campus Sint-Lucas Ghent & Brussels

> *"Threads may be transformed into traces, and traces into threads. It is in through the transformation of threads into traces, I argue, that surfaces are brought into being. And conversely, it is through the transformation of traces into threads that surfaces are dissolved".*[1]

Abstract

The adoption of digital fabrication technologies in architecture allows for novel ways of translations between designing and making, between idea and materialization, a role that since the emergence of the profession has been fulfilled by architectural drawings. This paper reflects on the role of drawing in architectural practice mediated through digital fabrication, and its impact on the allocation of authorship. Based on three design explorations from architectural practice and teaching, using computation and digital fabrication, the paper looks into different types of lines emerging from those processes: threads, traces & folds. This tentative, not exhaustive, categorization of lines is based on their agency in the translation between design idea and material artifact. The paper proposes *substantiating lines* as a way of researching processes mediated through computation and digital fabrication. This approach is situated them within the lineage of architectural exploration of the gap between drawing and making, instead of approaching digital fabrication as closure, where digital models provide complete determinacy of the material artifact.

Between Designing and Making

In architecture, there tends to be a distance between the acts of designing and making; architects do not work with the object of their thought directly, but do so through intervening media. This distance can be traced back to the origin of architecture as a profession[2] and the establishing of drawing as its principal means for exploring, communicating and materializing design ideas.[3] Throughout the multiple developments in theories of perspective and projection, descriptive geometry, drawing tools and media and technologies of reproduction, drawing has remained central in how we conceive of and practice architecture. Architectural drawing is not a mere tool for capturing and notating design ideas, it contributes to uncovering novel design ideas, in other words, 'drawing is a form of thinking'[4].

In his influential essay *'Translations from Drawing to Building'* Robin Evans argues that the power of drawing as a medium relies on its *'distinctness from and unlikeness to the thing that is represented, rather than its likeness to it.*[5]' The architectural drawing is different from the building and its functioning as a design medium relies on understanding that difference. Rather than providing complete determination in advance the role of the drawing is transitive: translating between idea and materialization drawing allows linking the abstract and the corporeal, leaves room for the emergence of design ideas and extends the journey of design exploration, and has the potential to reach destinations further than intended.[6]

Autographic and Allographic Practices

The distance between designing and making has led to different understandings of where authorship can be located in architectural work. One could locate authorship in the drawing, as it captures the design intent of the architect without being constrained by the contingencies of building practice[7]; or you could locate the authorship in the building, reducing the drawing to a mere instrument to arrive at its construction. In practice, these extreme positions[8] are hard to maintain and authorship lies somewhere in-between and is never absolute. The drawing only partially reflects design intent; it introduces its own qualities, and cannot completely control the process of building that depends on many parameters and external influences[9]. As Stan Allen states: "*architectural drawing is in some basic way impure, unclassifiable. Its link to the reality it designates is complex and changeable*"[10].

In his classification of different art forms, Nelson Goodman makes a distinction between autographic and allographic practices.[11] In autographic arts, such as painting and sculpture, the authenticity of the work depends on it being executed by the artist; in other words, it bears the traces of the hand of the artist.[12] In allographic arts, such as music or poetry, the work can be executed without the direct presence of the author. Where autographic arts work directly with the matter at hand, allographic arts work through notation, usually

leaving the execution to others. Allographic arts are often temporal and ephemeral, as in music, or need coordinated execution by many people, as in a theatre or in an orchestra.

Nelson Goodman considers architecture to be a "curious mixture" of autographic and allographic practices. Like other arts, architecture started out as the autographic practice of making and building but has acquired allographic elements through the introduction of notation in the form of the drawing. Unlike other allographic practices, architecture deals with concrete material and is not purely ephemeral, but its construction needs the coordinated execution by many people. Architectural drawings cannot be reduced to "pictures" of a future building, according to Goodman; he compares architectural drawing with a musical score, an instruction that combines graphic notations with texts and symbols. The instructions captured in an architectural drawing are not complete and need to be complemented through other documents, the process of building involves many decisions to be made, often requiring the architect to visit the construction site.[13]

Introducing the Machines

Over the last four decades, digital technologies have had an increasing impact on architecture to the extent that almost all design processes are mediated through digital technologies. In more conventional architectural practice[14] the impact was initially limited to the hardware and software architects use for drawing, resulting in mimicking analogue predecessors of drafting, modeling and rendering. Only more recently through the increased accessibility of computation, the development of building information modeling and the adoption of digital fabrication, have digital technologies also affected the translation between designing and making.[15] Digital fabrication has allowed for the production of designs that go beyond standardization, and inspired architect to develop new theoretical understandings and material sensibilities.[16]

The adoption of digital fabrication has once again brought materiality and making to the center of attention in architectural design, both in academia and in practice. This shift requires us to rethink the transfer between designing and making, between drawing and building, and the allocation of authorship within architectural work. A number of researchers, most prominently Branko Kolarevic[17], have argued that the adoption of digital fabrication technologies could lead to a more central position in making and construction for the architect. Suggesting a return to the role of the master-builder, shifting architecture back to its autographic origins. In contrast, Mario Carpo sees the adoption of digital fabrication technologies in architecture as the final emancipation of architecture into a fully allographic practice. *[18]*

These positions are opposed in where they allocate authorship and how they interpret the nature of transfer between design and making as affected by digital fabrication. Kolarevic[19] stresses the importance of collaboration and shared digital models and positions the architect central in this shared digital environment. Carpo[20] gives the architect full authorial control over both drawing and building by describing the cad file as an absolute and unequivocal form of representation that can be materialized regardless of place and time. While they differ in nuance, they both propose that the adoption of digital fabrication in architecture offers the potential for an increased authorship for architects, an increased control over materiality and making.

In both positions, we can read an assumption that technologies, in particular, digital modeling and digital fabrication, are neutral and transparent, collapsing the gap between designing and making. In his book "*The Death of Drawing, Architecture in the Age of Simulation",* David Scheer argues that this is part of a larger cultural shift from representation to simulation, finally catching up with architectural practice. Whereas architectural representation operates through understanding the difference between the drawn and the build, a simulation collapses this difference and *performs or behaves as* the build, at least partially and temporarily. According to Sheer, the adoption of building information modeling and digital fabrication technologies renders architectural drawing obsolete, as these technologies rely on simulation rather than representation. [21]

Extending the Journey

Based on the experience of using digital fabrication in practice and teaching, it is my assumption that there remains a role for drawing and representation, i.e. that digital models do not provide complete determination of the materialized artifact. The research project takes a close look at what happens in the transfer between file and artifact, it approaches digital fabrication not as neutral means of closing the gap between designing and making, but as a set of technologies that allow for specific ways of transferring and bridging this gap. This research questions whether digital models work only as simulation providing complete determinacy in advance or that some of the transitive properties of drawing remain, taking Robin Evans advice to extend the journey between designing and making, which might lead to novel design outcomes.

This paper is based on three design explorations that report on such journeys of going from design intent to fabricated artifact. In that sense, in this paper, I use the term allographic in its literal translation from Greek, which means “other writing”, as opposed to autographic, which means “own writing”, or “handwriting”. Rather than using digital fabrication as a technology that allows uninterrupted translation of intent into matter, it is exactly the traces of this otherness, the *allo*,[22] which interested me while undertaking these design explorations. Instead of striving for complete control over the fabrication process, the research project looks into how materials, code and fabrication machines contribute to the design outcome. How drawings, more particularly lines, have agency in the translation from idea to artifact, and allow for reaching destinations further than foreseen in either the technology or the design intent.

Lines, Threads, and Traces

Materials go through a number of transformations before being applied in architecture: processes of growth, sedimentation, synthesis. Raw matter is harvested and worked into materials, components, and products for building. Material transformations continue during construction and after, through use, aging, weathering and repair. All of these processes leave traces in the materials and the artefacts constructed from them, designing with these traces has a long history in architecture.[23]

The traces found in designed artifacts are as much the result of natural processes as they are of disciplining material through industrial processes into sheets, beams, and building components. Tim Ingold argues that the conception of architecture as being built up from geometric components, like a giant jigsaw puzzle, is only relatively recent; he locates the origins of architecture in practices of weaving, basket making, carpentry and other crafts. In these practices, form is not predefined as a kit of parts but emerges out of the gradual process of weaving of threads, or gradual shaping of materials through an understanding of their intensive makeup, as in stone- and woodworking.[24]

The use of materials in digital fabrication can be understood from the ideas outlined above: materials used for digital fabrication tend to be highly standardized and industrial[25] - sheet and block materials for cutting and milling, filament or powder for additive manufacturing - but fabricated artifacts tend to be highly specific, non-standard and unique. This has typically led to an even more complex kit of parts, where every component that makes up a structure is unique and can be described geometrically and exactly fabricated. Digital fabrication processes leave traces of their own: the trace followed by a cutting mill, the burned edges of a laser cut sheet or the layered build-up of additive manufacturing. Instead of using digital fabrication for precision and exactly replicating digital models, *substantiating lines* proposes an alternative use of digital fabrication, exploring and embracing these traces.

Design Explorations

The argument of this paper is based on my doctoral research conducted at the MMlab, Faculty of Architecture, KU Leuven, and work done as a guest researcher at the Architectural Robotics and Computation Lab of the Aarhus School of Architecture, where some of the work discussed was exhibited.[26] While the projects are different in scale, context, and focus, they emerged from an interest in digital fabrication technologies and explores their potential and limitations for design. It is only through conducting these explorations that the focus on the role of drawing in digital fabrication processes emerged and was further developed.

Encoded Matter

The *Encoded Matter* project consists of a series of design experiments that look into inexpensive, open-source and self-built, additive manufacturing as a specific fabrication technology, explores its potential and limitations. The project aimed to uncover how the materials, the fabrication machines, and the code that runs them influence the materiality of the fabricated artifacts. Important to this project is the accessible, open and hackable nature of the technology both in hardware and in software. This allows for a close inspection of how the fabrication processes leave traces and unfold in time, and how this performance can be hacked in order to achieve specific material qualities in the fabricated artifacts. During the design exploration, different series of artifacts were designed and fabricated, and a specific design tool for each of these series was developed.

Series 1: Objects Without Skins (Fig 1-4) - Going from file to artefact requires processing a digital model through a machine specific software. In additive manufacturing this means going from a digital model describing the outer shape of an artefact – as a triangulated mesh – to a file that encoded the movement of the tool head and describes the fabrication process and how it unfolds in time – a g-code file. The starting point of this series was to go beyond the volumetric description of the artifact as a mesh and directly generate

the g-code from within a custom developed design tool, written in Processing[27] and Grasshopper[28]. This results in material qualities that are radically different from what the fabrication technology normally produces, and actually exploits the difference between the encoded file and the materialised artefact, not as a failure but as design potential.

Series 2: Hatching with Matter (Fig 5-7) - In architectural drawing, hatches and line-weights operate as symbolic notations of materiality, some properties of the represented material are reflected in how the hatches and lines are drawn, e.g. thicker lines and denser hatches tend to represent heavier and denser materials. The series of artefacts explore digital fabrication as drawing with matter. Instead of approaching hatches and lines as a symbolic notation, they are used directly to control translucency and density of the material. The same algorithms used for generating the fabrication files are used for making drawings through a pen plotter. These drawings are themselves outcomes of the same processes, they are not made as notations prior to fabrication, and the process of making them enacts a performance similar to the movement of the tool head of the fabrication machine.

Series 3: Pushing Material and Machine Limits (Fig. 8-9) **-** Like all digital fabrication machines, the 3D printer used had limitations[29]: the size of the print was limited, shapes with overhangs cannot be printed, it has a relatively slow speed and only specific material can be used. The resulting prints clearly show material traces of the printing process: the flat bottom due to the heated bed, the visible layers and threading where unsupported overhangs occur in the model. Instead of printing finished objects panels were printed that could be assembled into larger objects afterward. The panels were kept flat, so printing times were greatly reduced. Because of the heated bed, the panels had a flat side and a more articulated side. While assembling, both of those sides could be used as an outside of the object, resulting in radically different artifacts with a materiality and scale that went beyond what normally can be produced with these machines.

The main contribution of this project lies in the shift of describing the form of an artifact to encoding the process of fabrication in time, and the material qualities that are afforded by this shift. The digital drawing encodes the movement and material deposition of the printer as a series of lines. However, these do not completely determine the artifacts; it is only through the actual performing of the act of making, substantiating these lines, that the materiality of the artifacts is achieved.

Hybrid Territories.

Robotic hotwire cutting (RHWC) has been pioneered by Asbjørn Søndergaard, Jelle Feringa, and Wes McGee at the Aarhus School of Architecture, TU Delft and Taubman College of Architecture[30]. The most common use of the technology is to use a heated nichrome wire mounted on an industrial robot arm to cut blocks of eps foam. The resulting blocks are mostly used as molds for casting concrete, but can also be used as positive pieces in prototypes and installations. The main advantage of this technology is that it is fast compared to milling of eps foam, where materially is gradually milled away.[31] I have participated in the Soft Structures workshop taught by Anders Kruse Aagaard and Ryan Hughes[32], introducing participants to the design, the programming of a robotic arm, the cutting and casting process. In order for the concrete not to adhere to the mold we experimented with various textiles, demolding and retarding agents, resulting in different surface finishes.

As a continuation of the Soft Structures workshop, Ryan Hughes and the author developed a hybrid fabrication approach that combines hotwire cutting with milling. Instead of mounting a fabrication tool on a robotic arm (tool-to-part), the robot arm picks up a block of foam and moves it to several tools positioned around the robotic arm (part-to-tool). The resulting process combines the speed of hotwire-cutting with the precision of milling; geometrically the parts combine the ruled surfaces of hotwire cutting and the lines of the tool paths of the milling. The casting process was further developed so that both pieces of foam cut-off by the hotwire were used as a mold. The resulting pieces on one side had a milled surface and on the other, a hotwire cut ruled surface.

In total nine pieces were produced, to be assembled into a wall or screen, gradually becoming rougher towards the top, this effect was produced through increasingly distorting the toolpaths. While the instructions for milling the foam are, only a list of targets the robots move the block towards, the shape and size of the milling bit determine the thickness of the line this produces. The materiality of the parts is further influenced by the material composition of concrete, the process of casting and demoulding. From each step of the process: the foam block, the mold and the final cast piece, high-resolution 3D scans were made. These scans were combined and overlaid with the machining instructions in a piece of software, which slowly panned and

zoomed through these hybrid territories (Fig. 10-12), revealing the negotiation between toolpath and materiality, between mould and casted surface, between lines and substance.

Timber Roof Structure
This project was made as a continuation of the modeling process for a renovation project of a single-family house by Perneel Osten architecten[33] (www.perneelosten.be), in collaboration with the author. During the architectural design and development process a number of material and digital design models were produced: sketch models, scale models, explicit digital models, parametric models, presentation models and mock-ups[34]. The parametric models allow for variations in design to be explored differently than other types of design models and have the ability to inform design decisions and their flexibility to respond to local changes.

The central element of the architectural project consists of a timber roof structure (Fig 14-17) that covers the existing part of the house, is folded over the new extension and comes down to demarcate the entrance and exterior functions. For the largest part of the project, the timber roof structure is visible, both on the inside and on the outside. The roof structure is supported by new and existing brick walls and three concrete volumes. It unites different spaces, providing a similar architectural articulation throughout the project while adapting to the new and existing support structures, and articulating local spatial conditions.

Three parametric models were made during the design of the roof structure and its support structure, encoding geometric and material constraints, allowing for exploring design variations and providing feedback: (Fig. 13) a model for designing the overall shape of the roof folded over the existing building and the extension, and defining the material articulations of the primary and secondary beams, (Fig 18-19) a model for designing the concrete volumes and the necessary formwork for construction and (3) a model resolving complex timber joints where varying numbers of the main beams meet. Instead of making one master mode aiming to control the overall geometry, this agile modeling approach is developed to tackle specific design issues when they arise during the design process.

The first two models are mainly concerned with geometric and structural issues, folding the roof and keeping it planar, and providing control over the distancing of the primary and secondary structures, their result is a clear structural diagram, consisting of the axis-lines for the beams meeting in a single point in space. The third model (Fig. 20-23) looked into the challenges that arise from materializing these structural axes, incorporating geometric, structural and fabrication constraints in a parametric model of each of the joints of the timber structure. The axis lines negotiate between several scales of the structure: while they resolving structural issues on the larger scale, thickening them and fitting timber beams to them provides a whole new set of design challenges. The main design issue here is geometric: given that all the beams are rotated at different angles, they have different heights when they meet in the joint.

During my research stay in Aarhus I fabricated two prototypes as a possible solution for those joints. The prototype combines steel fins which have been cut with a waterjet and wood that has been milled with a 5 axes CNC, the whole is bolted together. In going from the axis-lines to a materialised artefacts, tolerances and fabrication constraints, and material behaviours had to be taken into account: a pocket was milled in the wood to make place for the material of the weld, tolerances where introduced for the countersinks and whole for bolting, laser-cut jigs were used as support while welding the steel. The timber and steel joint demonstrates that material behaves, wood warps when drying, steel deforms when welding and diverges from the geometries describing them, but also that the precise and carefull use of digital fabrication machinery allows for designing anticipating these behaviours through tolerances.

Conclusion

The design explorations are different in their origin in practice and teaching, their scale and the kinds of research they give rise to: The *Timber Roof Structure* design exploration is clearly project driven; the questions emerge from resolving issues of structure and fabrication in order to achieve a structure that negotiates spatial experience and material articulation. The *Hybrid Territories* project can be described as technology-driven research, where a specific technology is scrutinised to uncover what material qualities can be achieved in the application of this technology. Whereas the *Encoded Matter* project started out as technology driven, it evolved into a more process-driven research, directly addressing the role of drawing in a design process mediated through digital fabrication, without necessarily working towards a direct application. All three, however, demonstrate how substantiating lines might be used as a way of researching design processes

mediated through computation and digital fabrication.

The fabrication machines used in these design projects, and the fabrication processes they afford, leave their own marks in the fabricated artefacts: the visible layered structure, limits in size, and the flat bottom of the prints due to the heated bed, the impossibility of printing overhangs and the visible material threads in the *Encoded Matter* project. The traces of the mill and the ruled surfaces in the *Hybrid Territories* project, as well as the material traces of moulding and casting concrete. The various textures resulting from milling the timber beams in the *Timber Roof Structure* project. The machines, being material contraptions driven by code, inherit aspects and qualities from both the material they work with and the code that runs them. Moreover, taking digital code as an input and generating material objects as an output makes traces of the code apparent in the material world. Instead of seeing the grain, the resolution and visible traces of the technology as a problem, something to be resolved through a better, newer version of the technology, we can design for and with these qualities, it is these qualities I describe as being allographic, thus extending the notion to include agency of code, matter and machine.[35]

This paper questioned whether the introduction of digital design technologies leads to a shift toward an allographic design practice, or allows a more autographic role to be reclaimed. While the scale, scope and nature of these projects leave many questions unanswered, from a distance, these projects look very similar to an autographic, crafts-like endeavour; but that fails to notice the allographic qualities that drive this work. The design projects described in this paper started from wonder for and an interest in making material things, and the pleasure I find in unravelling and understanding the inner workings of both code and machines. The source of this wonder and pleasure lie in the allographic qualities found in material, code and machine. I do consider myself the author of these works, but their specific qualities could only emerge in the mangle[36] of a design process that operates between the material and digital world, and negotiates with agencies external to those of the designer.

The paper demonstrates that there remains a distinction between the digital file and the resulting material artefact, that our material world is not made up of vectors, pixels and meshes, albeit informed by them[37]. In that sense digital models, although they might be intended as simulations that provide complete determinacy in advance, retain the transitive qualities that characterise architectural drawings. The paper described different kinds of lines and their agency in the design process mediated through digital fabrication: (1) the trace, a line resulting from an act of fabrication, the trace of a mill or a hotwire cutting through foam as demonstrated in the *Hybrid Territories* project; (2) the thread, or the gradual build-up of the artefacts in the *Encoded Matter* project, directly drawing or hatching with matter; (3) the folded line of a triangulated roof that becomes an structural axis line in the *Timber Roof Structure* project, that negotiates between structural scheme and its materialisation. These kind of lines produced during the design explorations, while far from being an exhaustive list, demonstrate that designing mediated through digital fabrication can be approached as *substantiating lines,* and that such an approach can lead to novel material outcomes.

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[1] Tim Ingold*, Lines: A Brief History* (2007). p.52.

[2] This can be traced back to the Renaissance, more particular Alberti, see Perez-Gomez, Alberto, and Louise Pelletier. *Architectural Representation and the Perspective Hinge*. The MIT Press, 2000.

[3] Models also play an important role, but are not as extensively studied. see Bradley Starkey, Post-Secular Architecture, Material, Intellectual, Spiritual Models, in Marco Frascari, Jonathan Hale and Bradley Starkey, *From Models to Drawings: Imagination and Representation in Architecture* (2007). p.231.

[4] Steven Groák, *The Idea of Building: Thought and Action in the Design and Production of Buildings* (1992), p. 150

[5] Robin Evans, *Translations from Drawing to Building and Other Essays* (1997). p. 154.

[6] Robin Evans, *Translations from Drawing to Building and Other Essays* (1997). p. 156.

[7] Jeremy Till, *Architecture Depends* (2009), pp. 44-56.

[8] For an interesting discussion outlining different contemporary positions, see Riedijk, Michiel, *Architecture as a Craft: Architecture, Drawing, Model and Position* (2010).

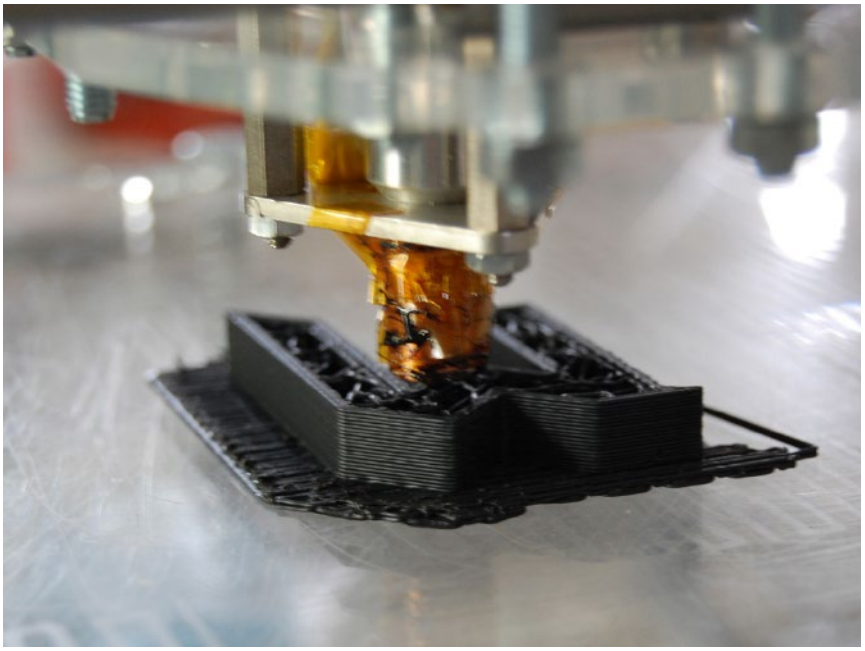
[9] Jeremy *Till, Architecture Depends* (2009), p. 45-63.

[10] Stan Allen, Mapping the Un-mappable, in *Practice: Architecture, Technique + Representation* (2009). p.41

[11] Nelson Goodman, *Languages of Art (*1976). pp. 99-174

[12] This is obviously a generalization, many examples of sculpture and painting can be found that are partly executed by other hands than that of the artist.

[13] Stan Allen, Mapping the Un-mappable, *in Practice: Architecture, Technique + Representation* (2009). pp. 48-49.
[14] Ever since the late '60 computation has inspired more avant-garde architects, see for example the early work of John Frazer, Frazer, John. *An Evolutionary Architecture*. London: Architectural Association, 1995.
[15] See Stephen Kieran and James Timberlake, *Refabricating Architecture: How Manufacturing Methodologies Are Poised to Transform Building Construction* (2004) and Neil Leach, David Turnbull and Chris Williams (eds.), *Digital Tectonics* (2004).
[16] See Gramazio & Kohler. Digital Materiality in Architecture. Baden: Lars Müller Publishers (2008)
[17] See Stephen Kieran and James Timberlake, Refabricating Architecture: How Manufacturing Methodologies Are Poised to Transform Building Construction (2004), pp.27-31. and Branko Kolarevic, "Information Master Builders" in Branko Kolarevic, Architecture in the Digital Age: Design and Manufacturing (2005). pp. 55-62.
[18] Mario Carpo, *The Alphabet and the Algorithm*, Writing Architecture (2011), p. 78.
[19] Branko Kolarevic, "Information Master Builders" in Branko Kolarevic, Architecture in the Digital Age: Design and Manufacturing (2005). pp. 55-62
[20] Mario Carpo, *The Alphabet and the Algorithm*, Writing Architecture (2011), p. 78.
[21] Scheer, David R. The Death of Drawing: Architecture in the Age of Simulation. (2014).
[22] Allo or otherness is used by Kostas Terzidis to describe the contribution of algorithms to a design process, see Kostas Terzidis*, Algorithmic Architecture* (2006), p. 27.
[23] While many examples could be given of architects and designers with a particular attention for these traces, I refer here to the books by Jonathan Hill, *Actions of Architecture: Architects and Creative Users* (2003) and *Immaterial Architecture* (2006), see also Ingold, Tim. *Making: Anthropology, Archaeology, Art and Architecture* (London, New York, Routledge, 2013).
[24] Tim Ingold, *Making: Anthropology, Archaeology, Art and Architecture* (2013).). pp. 47-48.
[25] There as been research into scanning natural materials for later use in digital fabrication, example the Woodchip Barn developed by AA at Hooke Park. See http://designandmake.aaschool.ac.uk/woodchip-barn/, consulted on 20/06/2017.
[26] See http://aarch.dk/info/updates/exhibitions/corneel-cannaerts-exhibition/, consulted on 01/03/2018
[27] Processing is an open source creative coding platform, developed at MIT Media Lab, see www.processing.org (consulted on 10/10/2017).
[28] Grasshopper is a parametric modelling environment for Rhinoceros, see www.grasshopper3d.com (consulted on 10/10/2017).
[29] Several printers were used: A Makerbot and an Ultimaker.
[30] Wes McGee, Jelle Feringa and Asbjørn Søndergaard, 'Processes for an Architecture of Volume', in Proceedings of Rob|Arch 2012:Robotic Fabrication for Architecture, Art, and Design (Vienna: Springer, 2012), pp. 62–71. And Jelle Feringa and Asbjørn Søndergaard, Fabricating Architectural Volume: Stereotomic investigations in robotic craft in, Gramazio, Fabio, e.a. Fabricate: Negotiating Design et Making. 2014.
[31] Anders, Jelle and ODICO reference.
[32] See http://aarch.dk/info/updates/exhibitions/soft-structures-exhibition/, consulted on 01/03/2018.
[33] See www.perneelosten.be, consulted on 01/03/2018.
[34] This project was part of the exhibition *Maatwerk \ Massarbeit: Architektur Aus Flandern Und Den Niederlanden*, 2016-2017 at the Deutches Architecturmuseum, Frankfurt.
[35] My understanding of agency has been developed by undertaking this research and is aligned with Andrew Pickerings notion of non-human agency, see Pickering, Andrew*. The Mangle of Practice: Time, Agency, and Science* (1995) and Knappert and Malafouris argument for material agency, see Knappett, Carl, and Malafouris, Lambros (eds.), *Material Agency: Towards a Non-Anthropocentric Approach* (2008).
[36] See Pickering, Andrew*. The Mangle of Practice: Time, Agency, and Science* (1995). pp. 21-26.
[37] Sheil, Bob, Distinguishing between the Drawn and the Made in Menges, Achim. *Material Computation: Higher Integration in Morphogenetic Design* Architectural Design. (2012).



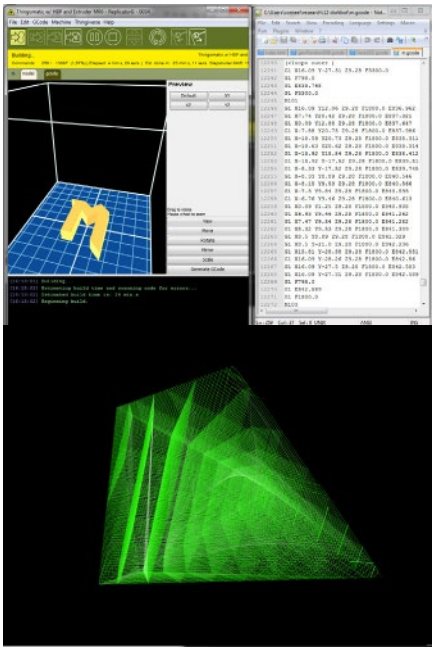


Fig. 1-2. Encoded Matter: Pushing Machine Limits

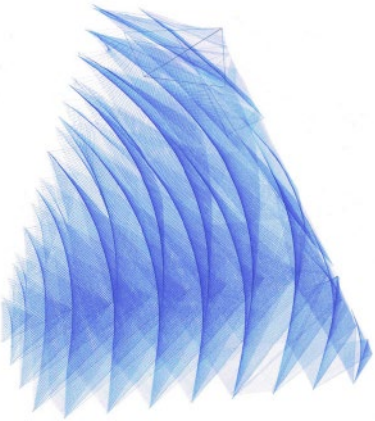
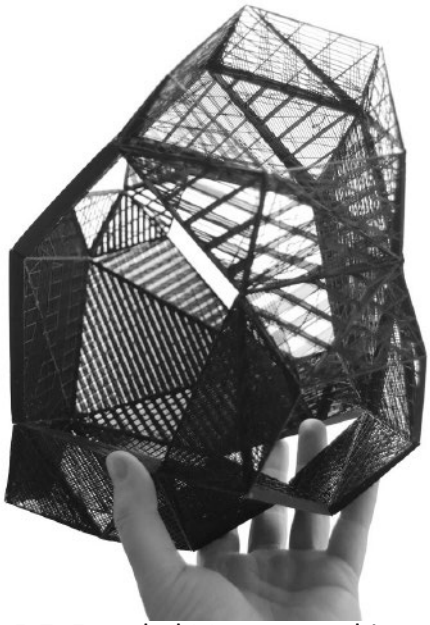


Fig. 3-4: Encoded Matter: Objects Without Skins, Artefact and Drawing



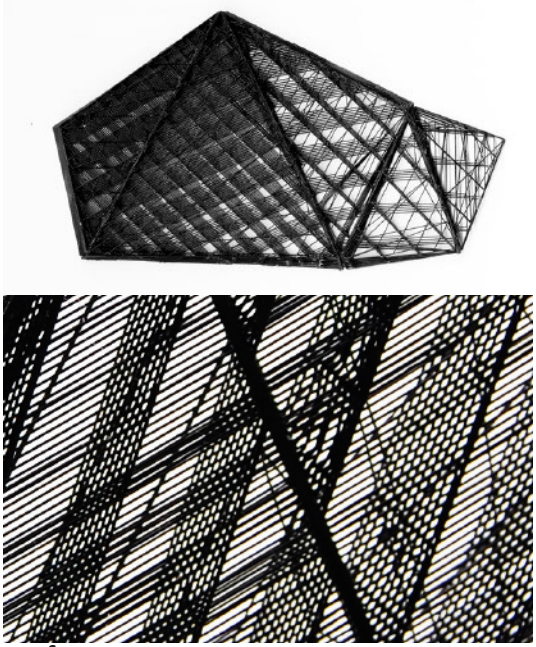


Fig. 5-7. Encoded Matter: Hatching with Matter, Artefact.

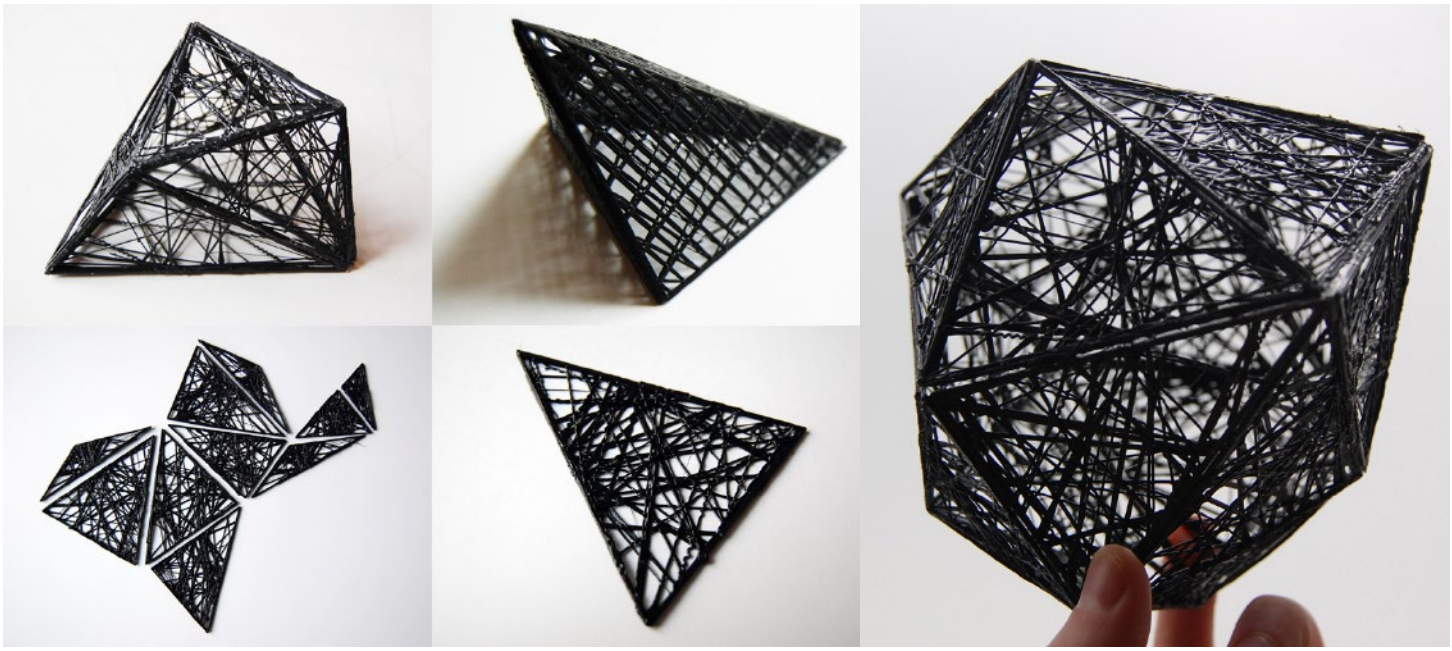


Fig. 8-9: Encoded Matter: Pushing Machine Limits

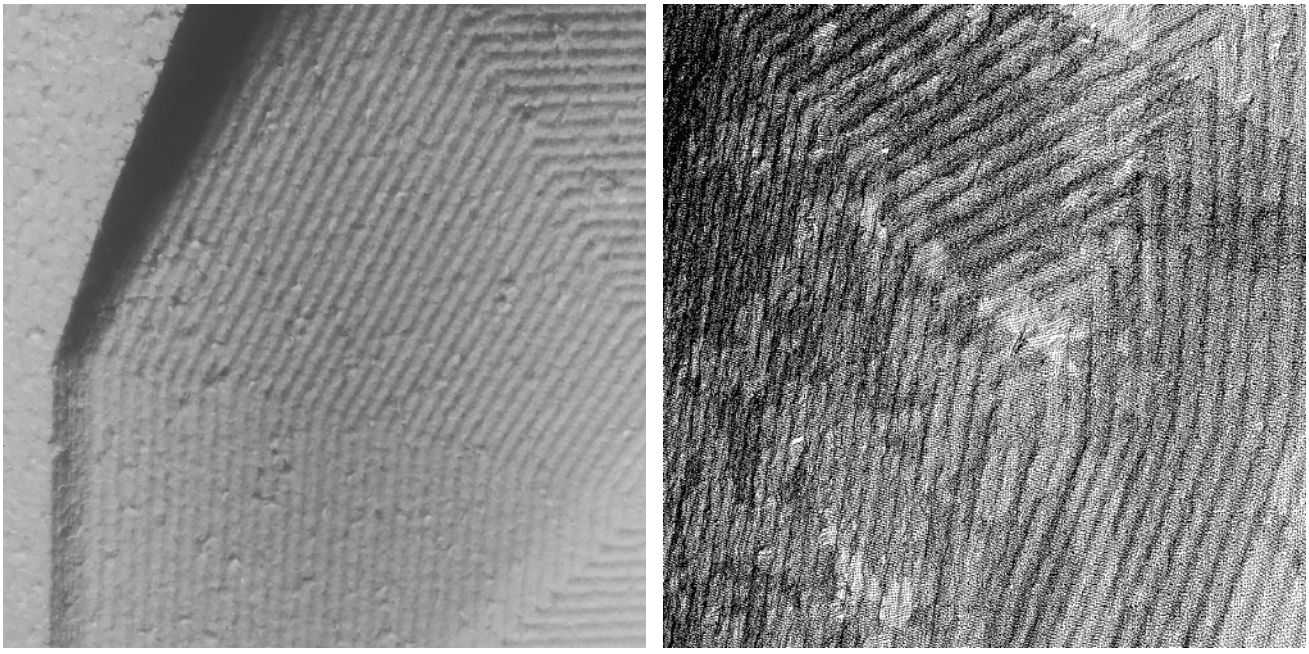


Fig. 10-11. Hybrid Territories: Photograph and Scan of Milling Toolpath.

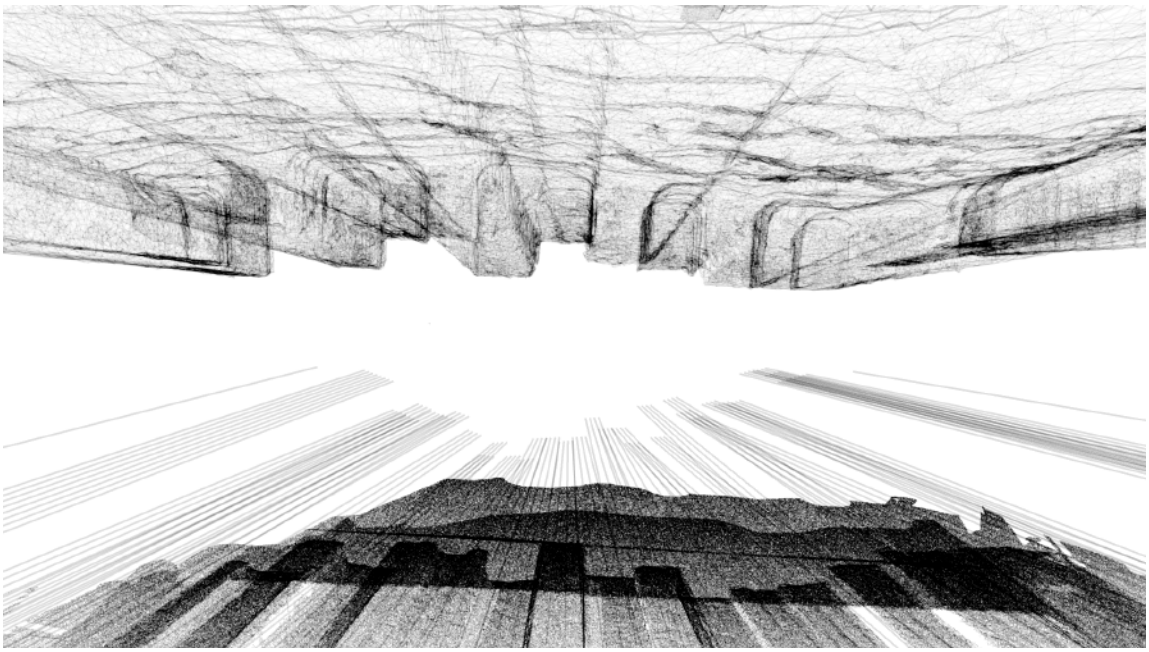


Fig. 12. Hybrid Territories: Software displaying lines and scanned surface.

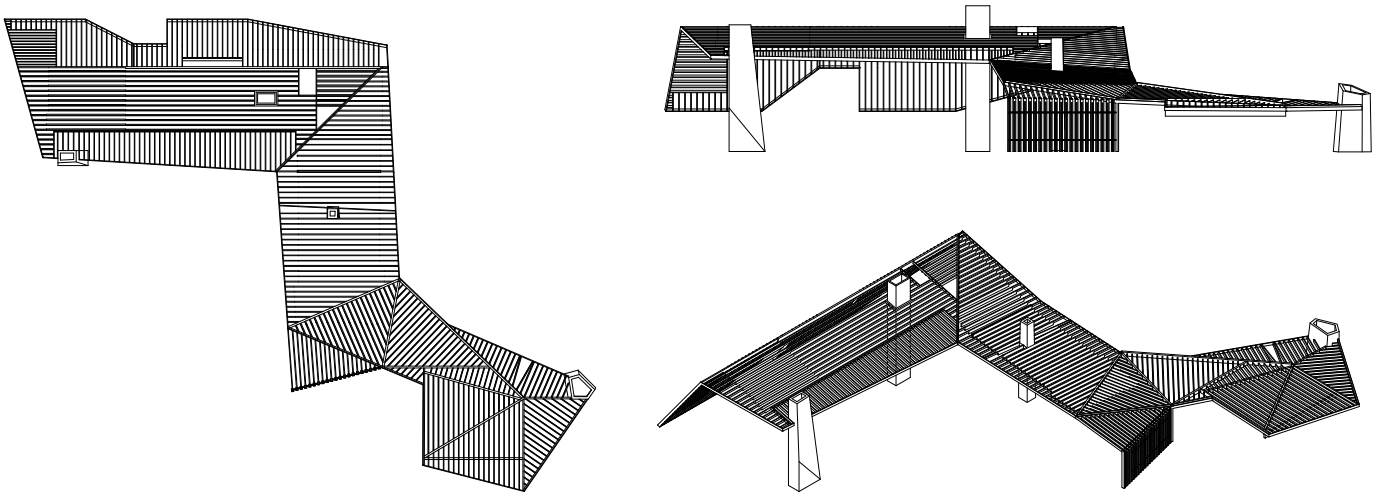


Fig. 13. Paramaetric Model 1: defining overall shape of the roof and the material articulations of the beams

Fig. 14-17. Interior photogaph of the built roof structure

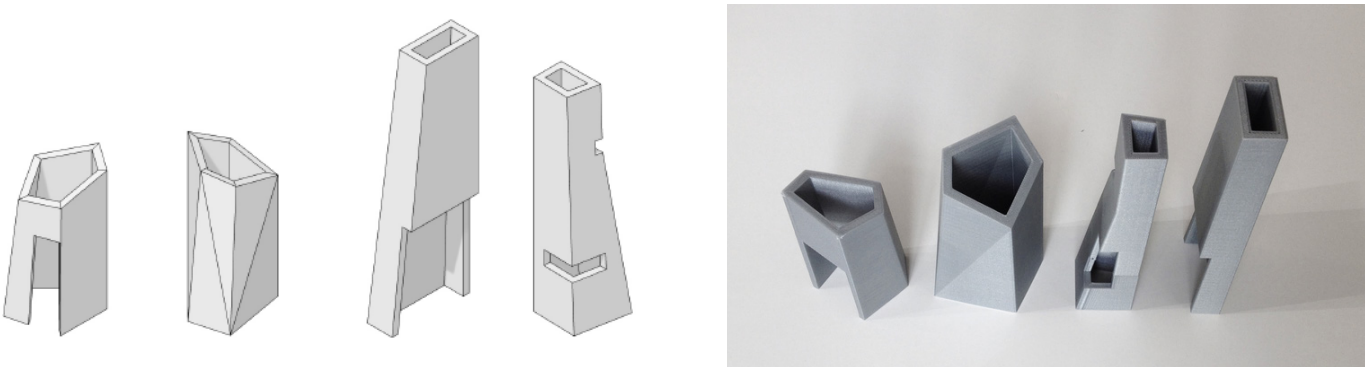


Fig. 18-19. Parametric Model 2: variations in concrete volumes and physical models

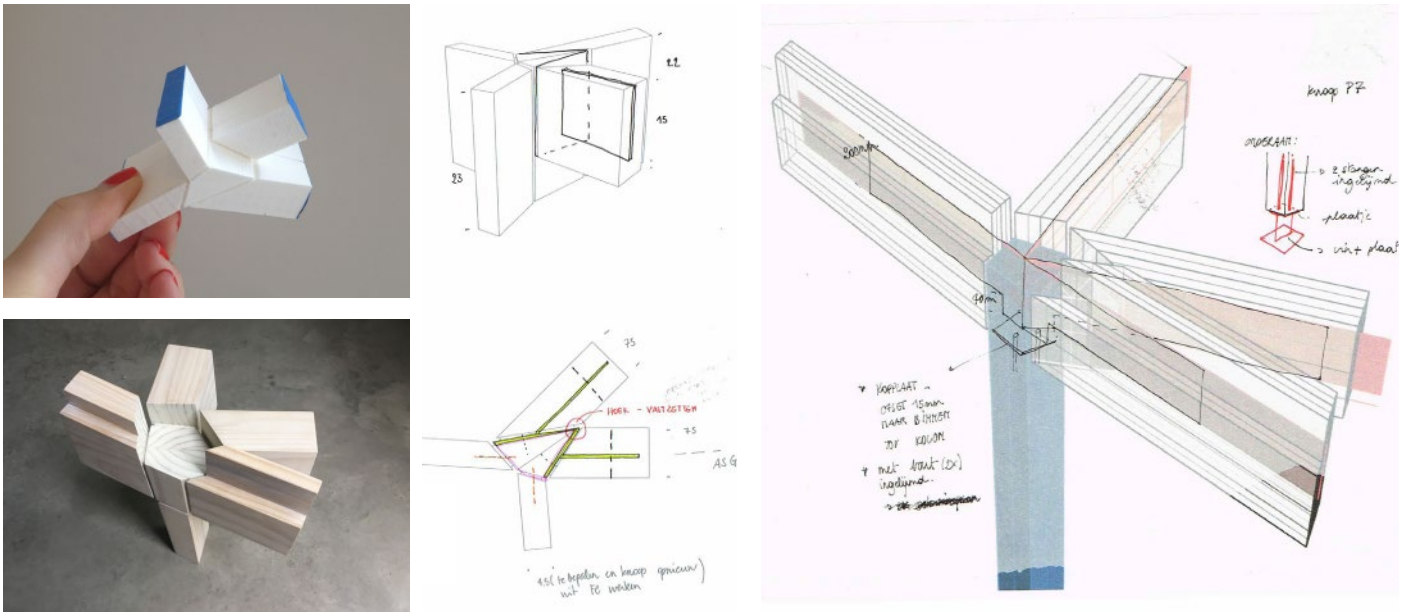


Fig. 20-23. Parametric Model 3: desinging and refining joints of main beams and physical model & mock-up.

RABBITHOLE RESEARCH (RBT_H0L)

TOWARDS A HYBRID MODELING TECHNIQUE IN ARCHITECTURE

AILEEN IVERSON

Rabbithole Research (rbt_h0l) : Towards a Hybrid Modeling Technique in Architecture

Doctoral Dissertation, Aileen Iverson RA, LEED AP TU Berlin Architecture, Prof. Ralf Pasel

What if there were a way to design with digital models similar to the way that we design with models in physical space? As architects we are problem solvers through the making of objects; a highly physical design process similar to sculpting methodology, engaging a rich field of encounters and information seen and unseen – sensed; a process of understanding-through-doing capable of reaching complex levels of comprehension beyond the cognitive. What if we can bring this level of engagement into the digital design environment with all of its power of parametric manipulations?
This research project is designed to examine these questions using the DIY sensors and microprocessors technologies - adding their sensory data capability (pressure, flexion, weight, etc.) into the digital environment, to create a hybrid physical-digital modeling technique. The goal is to achieve workability that approximates haptic methods and associated inherent material understanding, on which architectural practice is founded.
By focusing on modeling, the research specifically targets *architectural design process*, the early stages of design analysis and investigation, seeking maximum impact affecting the way we make/ think about architecture.
The project is motivated by writings of Juhani Pallasmaa and Classical Sculpture, specifically *contrapposto*, in identifying the act of modeling/ sculpting/ designing as one requiring the complex metric of physical systems necessary to examining questions spatially.
This research is also influenced by my 20+ years of architectural practice, one congruous with the shift in architecture from analogue (physical drafting and modeling) to digital; sensitizing me to what has been lost and gained in this shift.

Keywords: Hybrid Modeling, Architectural Design Process, Digital Modeling, Form-making, *contrapposto*

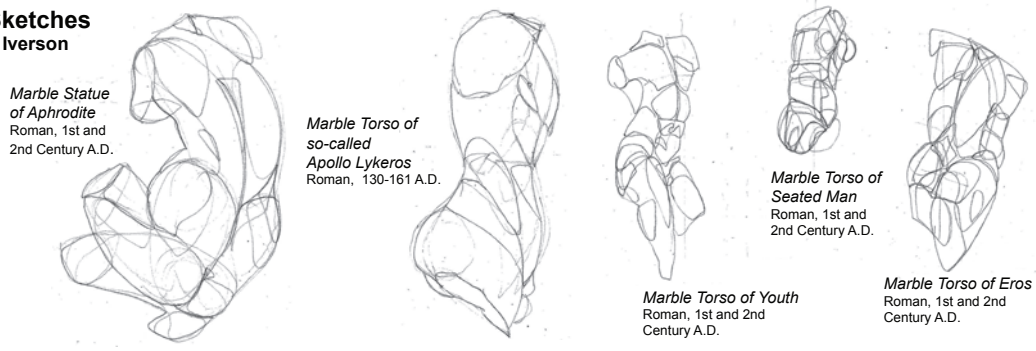
"If the world were clear, art would not exist." (Camus, 1942)

For me this quote suggests that all art, including architecture, functions as hypothesis: proposals for interpreting the world. As end products, (painting, sculpture, music, writing, photography, film, etc.) art embodies universal principles (time, space, nature, God, death, myth, etc.) precisely because it examines them. In this way art (and architecture) is able to resonate broadly irrespective of culture or time period and is therefore, while a product of its age, timelessly relevant.
Thus the first part of the research title, "Rabbit-hole" suggests that any architectural design and research, including the research presented here, functions as a hypothesis and represents only part of an endless exploration that grows, changes direction, and finds new ground – with our technological capabilities and project parameters.

research goal/ end product

The goal of this research is to arrive at a digital method for designing architectural form, one that incorporates aspects of the interaction between physical form and space (such as gravity and weight) as a way to move away from digital design as a primarily visual undertaking.
The present state of my research: developing a hybrid physical and digital modeling technique for designing such architectural form, suggests a dual system modeling technique in which a physical model integrating sensor technology will be linking to a digital model. The physical model will provide the tactile engagement with formal manipulation and transfer this to the digital model.

1. MET Sketches
2008, A. Iverson



between contrapposto and architecture design process

This research project is influenced by two compelling methodologies:

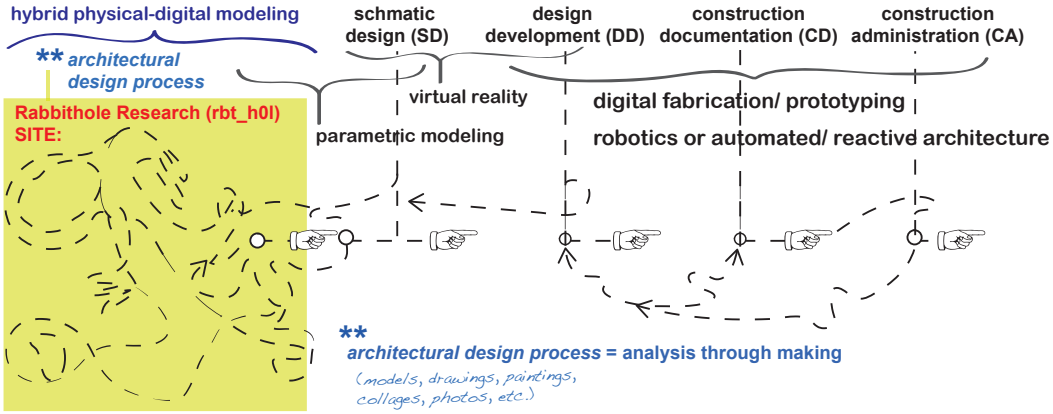
contrapposto in sculpture + design process in architecture

Contrapposto serves as muse and inspiration, while *architectural design process* serves as site or area of intervention.
The technique of *contrapposto* in Classical Sculpture, is one in which the figure is deliberately placed in an off-balance position. This wildly radical act represents a paradigm shift in sculptural practice and, no doubt, in the society witnessing this transformational understanding of figure and space. The technique of *contrapposto* required multiple axial rotations at various scales within the figure in pursuit of balance relative to material weight and gravity, producing an astounding degree of formal and spatial complexity, and an intimacy between form and space in which:

space, the negative partner of form, is calibrated in the reactions recorded in the figure. [image 1]

Architectural design process here refers specifically to the initial stages of architectural design where the form of the design object is being investigated/ discovered. **[image 2]**

2. diagram: architectural practice (phases) + status quo hybrid processes:



In this research *architectural design process* is defined as analysis through making, (drawings, models, etc.) – a uniquely tactile form of analysis in which: thought is action, ideas become spatial objects, and learning is a sensory-integrative experience. *Architectural design process*, as a method of discovery towards the as yet unknown design solution – is the targeted site of this research i.e. where this research seeks to intervene, thus seeking maximum impact affecting the way we make therefore think about architecture.

problem: digital context as spatially reductive

> "Human consciousness, ...is not merely in the brain but is fully embodied, needs an external environment pregnant with meanings and emotions for its self-awareness. It is futile to try to hypothesize what might happen if the environment was simply "smooth" and opposed no resistance ...Despite our present enthusiasm for digital communications ... our consciousness cant actually exist as a brain in a vat, in the absence of dialogue or exchange..." (Pérez-Gómez, 2016)

In contemporary *architectural design process*, that uniquely tactile analysis as form-making, is increasingly located in digital CAD environments which typically prioritize visual-based design, effectively removing the design object from its physical spatial context. In the sense that these CAD design environments typically do not include spatial conditions (gravity, weight, material resistance, etc.) these environments can be understood as reductive.

Therefore if, as suggested by the technique of *contrapposto*: critical manipulation of form requires a relationship between material and spatial conditions, then the problem becomes clear:

architectural design process, the engine of critical architecture, occurs in a spatially reductive environment, one incapable of providing the object/ context dynamic of forces acting through materials in space – or as described by Steven Holl in his forward to Juhanni Pallasmaa's text *The Eyes of the Skin*:

> "While our experience of the world is formulated by a combination of five senses, much architecture is produced under consideration of only one – sight." (Pallasmaa, 1995)

and W.J.T. Mitchell in *Back to the Drawing Board*:

> "... hasn't (architecture) now gone completely virtual, existing as much in speculative, notational and graphic or modular form as it does in actual building. And do not the buildings reflect this virtualization and liquidation, with the seemingly absolute malleability of shapes, materials, surfaces, and spaces." (Mitchell, 1995)

***contrapposto* solution**

Therefore in addressing the problem of locating the uniquely tactile method of analysis (*architectural design process*) within the anti-physical space of digital design, this research proposes the *contrapposto* solution wherein:

> **Complexity of form requires complexity of context** (in which the form is located).

hybrid physical-digital modeling technique

From his text *Attunment*, Pérez-Gómez asks:

> "Are there clues in the tradition of our discipline that point to strategies for embracing modes of understanding, perception, and representation other than the pictorial image? This is indeed the question I wish to pursue." (Pérez-Gómez, 2016)

With this question in mind I looked for clues in my own practice as well as others, toward establishing how best to add complexity – in terms of physicality (gravity, weight, material resistance, etc.) – into the digital context of 3D CAD. Thus the first step (and current stage of this research) involves the development of a new modeling technique – a hybrid of physical-digital modeling capable of translating tactile forces acting on a object in real space into forces acting on an object in digital space,

thereby inclusive of:

"...embodied experience(s) where meaning actually appears ... (un)differentiated among the sensory modalities, and hinging ... upon invisible availabilities present to perception in particular circumstances.." (Pérez-Gómez, 2016)

3. hybrid modeling diagram

Gaudi - example of inventing a new way of modeling

Gaudi, *La Sagrata Familia (*model)

Here also it is worth noting that in focusing specifically on model-making, reinforces the targeted site of this research project: *architectural design process.*

However before we look at this 'Frankenstein's Monster'/ hybrid modeling technique construction and current stage of this research, few important ideas regarding physical model-making as it contributes to the architectural profession, and observations from my own experience in using modeling as a tool in my practice, should be mentioned:

physical model-making

Again quoting from his text *Attunment*, Pérez-Gómez points out that aesthetics or:

"(aas-the-ses) Aisthésis in "the original (ancient Greek) sense ... (referred) not only to visual perception but to apprehension by all the senses, enabling an understanding ...of that which is perceived by embodied consciousness." (Pérez-Gómez, 2016)

From A*bstracting Craft: The Practiced Digital Hand*, Malcolm McCullough states:

"Constraints (in a medium) define specific formal possibilities and guide creativity into specific channels..."

also, "Acute knowledge of a medium's structure comes not by theory but through involvement." (McCullough, 1996)

The above quotes describe the encounter with material properties (in terms of weight, flexibility, strength, etc.) – which provides an external dialogue, capable of "taking us out of our heads" – therefore extending our thought process beyond the limitations of individual knowledge, experience, and preconception.

In manual architectural design process – sketching with pen or pencil, and thinking/ analyzing – feel simultaneous. The same holds true of physical modeling which becomes an immediate and integrative knowledge of hand and mind through the manipulation of materials in space conveying an unequivocal perception of 3D space. Such an embodied engagement forms a vital transfer of knowledge, moving from purely cognitive, theoretical knowledge to one that is practiced, integrated, and experienced.

In my own architectural practice, the act of working with physical model-making, with materials, whether:

a.) wooden sticks glued to form frames **[image 4]**

b.) or flat board scored to form curves **[image 5]**

can be described as a meditation with materials and tools that is not a straight path. During this process of model-making, new aspects of the material, its connections, massing and proportional relationships, etc. are discovered which inform and enrich the initial design intention and, perhaps more importantly, lead to new understandings in the relationship of form and space, such as and referring to the examples above:

a.) hierarchy of frames comes from position in framing system as much as from size of framing members/ distributed loads

b.) strength of flat material can be achieved through geometry with respect to material resistance

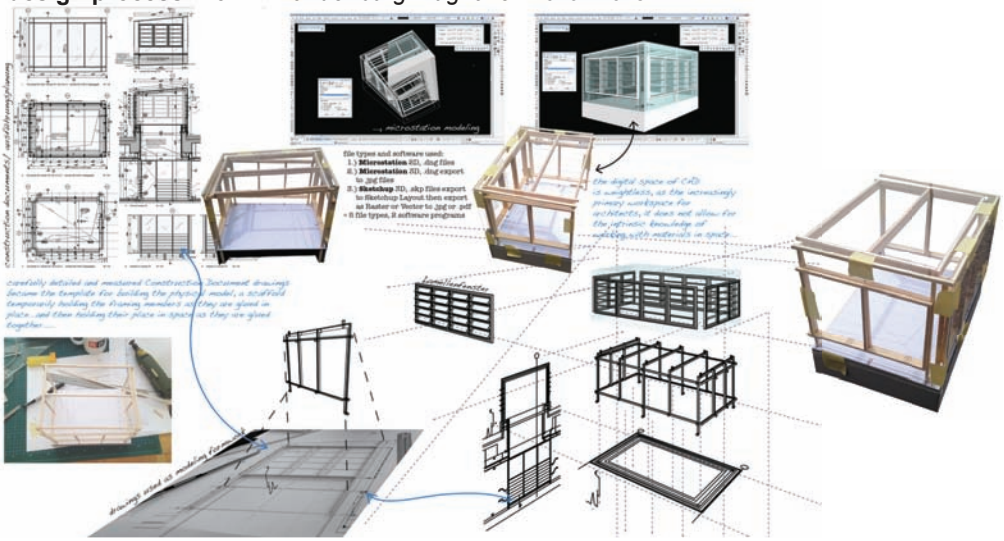
precedent: Gaudí, Otto

This was surely the experience of Antoni Gaudí and Frei Otto – architects who provide precedent for inventing a modeling technique in order to explore a new path for architecture, one in which form-finding involved subjecting physical materials to spatial forces.

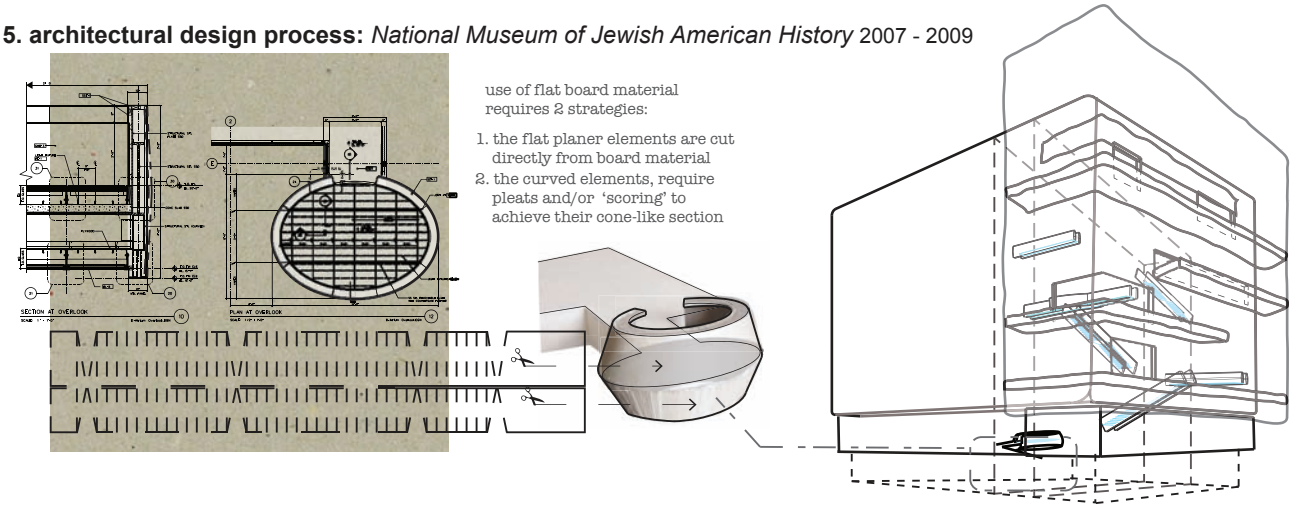
With regard to the technique of *contrapposto* (the act of initiating a figure in an off-balance relationship with gravity) similarities with the modeling process of Gaudí and Otto can be found in that all three strategies:

- shape the figure by subjecting it to a complex context of physical stresses
- recommend working with "simple" physical models (or sculpting) as the best method to examine spatial complexity

4. architectural design process: *Berlin-Brandenburg Flughalfen* 2016 - 2018



5. architectural design process: *National Museum of Jewish American History* 2007 - 2009



Further, through such modeling processes physical forces can be seen not as external to the object but rather as generated by the object, i.e. form-making reveals the dynamic physical forces of space that would remain otherwise undetected:

"... science has realized recently that it is as much about creating the world as discovering it." (Picon, 2008)

Importantly therefore: this doctoral research *purposely* chooses simple (physical) model-making as the means to add spatial variables into the digital environment rather than programming these variables directly into the computer.

historical roots of architecture

Also it should be noted – that this research project, which essentially seeks a tactile relationship with digital form-making, can be seen in-part as returning to the tradition, historically, of architectural practice as a hand-craft founded by masons, sculptors, painters, metal workers, etc.

hybrid digital-physical processes status quo

Locating this research in contemporary hybrid digital-physical practice reveals four main trends or categories:

- Parametric modeling, whereby digital 3D models are parametrically shaped by linking to external physical data such as: sun-path, circulation patterns, etc.
- Digital fabrication or prototyping, whereby a digital 3D model is realized in a physical form through digital 3D printing, laser cutting, or multi-axial routing.
- Robotics or automation, whereby physical components are linked and respond to data collection, for example: adjusting light levels or room temperature based on room occupancy data.
- Virtual Reality, referring to digitally simulated environments experienced via an immersive interface using virtual -reality-goggles and/or gloves, for example: software allowing architects to alter a design as informed by their virtual experience of it.

These practices have been integrating at various stages of architectural projects as corresponds to the level of detail required by each design phase: Virtual Reality technology is typically best suited in the Schematic or Design Development stage where the architectural design is refined whereas Prototyping is generally more suitable to the Construction Document stage where focus is on detailing and evaluating buildability.

rbt_h0l hybrid physical-digital modeling technique

The hybrid physical-digital modeling technique sought in this research project however differs from the above techniques in two ways:

- this research specifically targets the *architectural design process* 'phase', which is a discovery phase concerned with formal exploration and in which the formal design is yet unknown
- this research seeks a hybrid modeling technique whereby physical modeling controls its digital counterpart, thus information flows from physical reality to digital virtual space i.e. a physical-to-digital transfer; which is the reverse of the more common digital-to-physical methods whereby digital objects are transformed into physical objects, as in Digital Prototyping.

Fewer examples of the kind of physical-to-digital process sought in this research exist, however some of those approaching this methodology include:

- Tangible Media Group, MIT Media Lab – led by Professor Hiroshi Ishii in projects such as *Phixels*, physical pixels are constructed which correspond to digital pixels such that when the physical pixels are shaped (pushed or moved) the corresponding action is performed on the digital pixels.
- Surgical simulations using high-speed GPU (graphics processing unit) in which a digital surgical subject (body part or organ) is acted-on by physical elements (scalpel, tweezers, etc.). (T. S. Sørensen and J. Mosegaard, 2006)

rbt_h0l: current research:

The hybrid physical-digital modeling apparatus developed in this research uses: Arduino micro controllers and sensor hardware with Firefly plug-in software for Grasshopper. Combined this system can direct analogue sensor data to control physical objects (hardware), as in DIY robotics, or digital objects (software) such as Rhino digital modeling. The focus of this research is on the latter aspect, thus using analogue (physical) data to manipulate digital models.

Building the hybrid physical-digital modeling apparatus i.e. 'Frankenstein's Monster', is the first step of this research project and the subject of the following text. Subsequent stages of this research will explore the hybrid modeling technique in terms of its relevance to, and affects on, digital *architectural design process*.

rbt_h0l: hybrid modeling explored using architectural design process

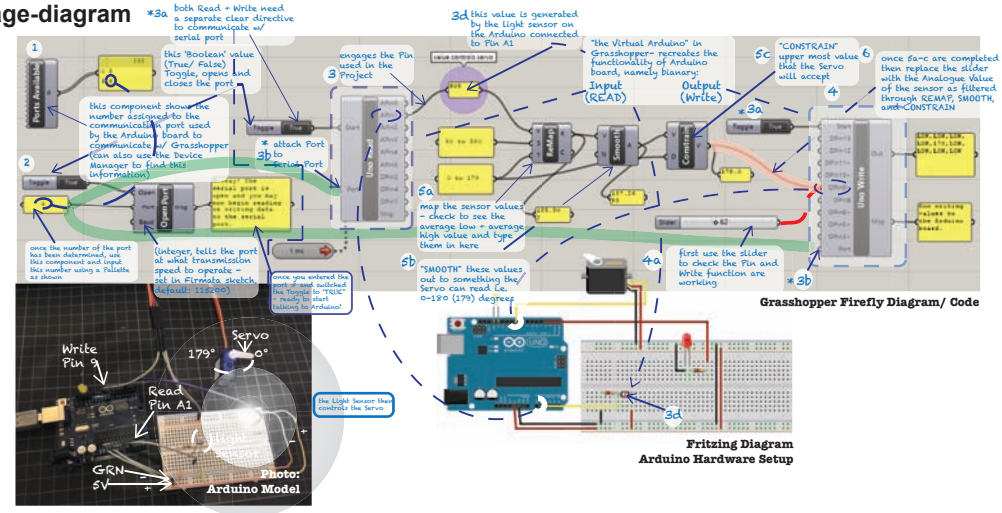
Architectural design process methods were used to explore the component parts of the hybrid technology as well as their physical-digital interactions. This is seen as a kind of doubling-down/ reinforcing of the goal of this research: to strengthen the architectural design process in contemporary digital practice.

Architectural design process produces "analytic makings" (drawings, diagrams, and models) containing inherent spatial relevance and thus lead to unanticipated findings, exposing idiosyncrasies, limitations, and potentials with respect to the hybrid technology and its spatial/ formal significance. These "analytic makings" include:

- Hardware models (simple micro controller and sensors models) were wired and programmed to test the ability for the physical/ analogue information collected by the sensors (distance, flexion, pressure, light levels, etc.) to affect hardware (LEDs, LCD screens, Servomotors) and software (Rhino model elements)
- Hardware collage-diagrams examining parametric graphic notation linked to Arduino hardware enabling analogue sensor data to be read and directed to control hardware (Servomotor) and software (Rhino).

[image 6]

6. hardware collage-diagram



- Digital Models and collage-diagrams describing 3D digital elements (mesh plane) linked first to parametric physics simulation software (Kangaroo) then replacing this with physical analogue hardware sensor data – to examine the process of adding forces (gravity, point load, etc.) to digital objects. Notably: this required 'mapping' the analogue sensor data to a more controlled set of numbers i.e. more regular input values.

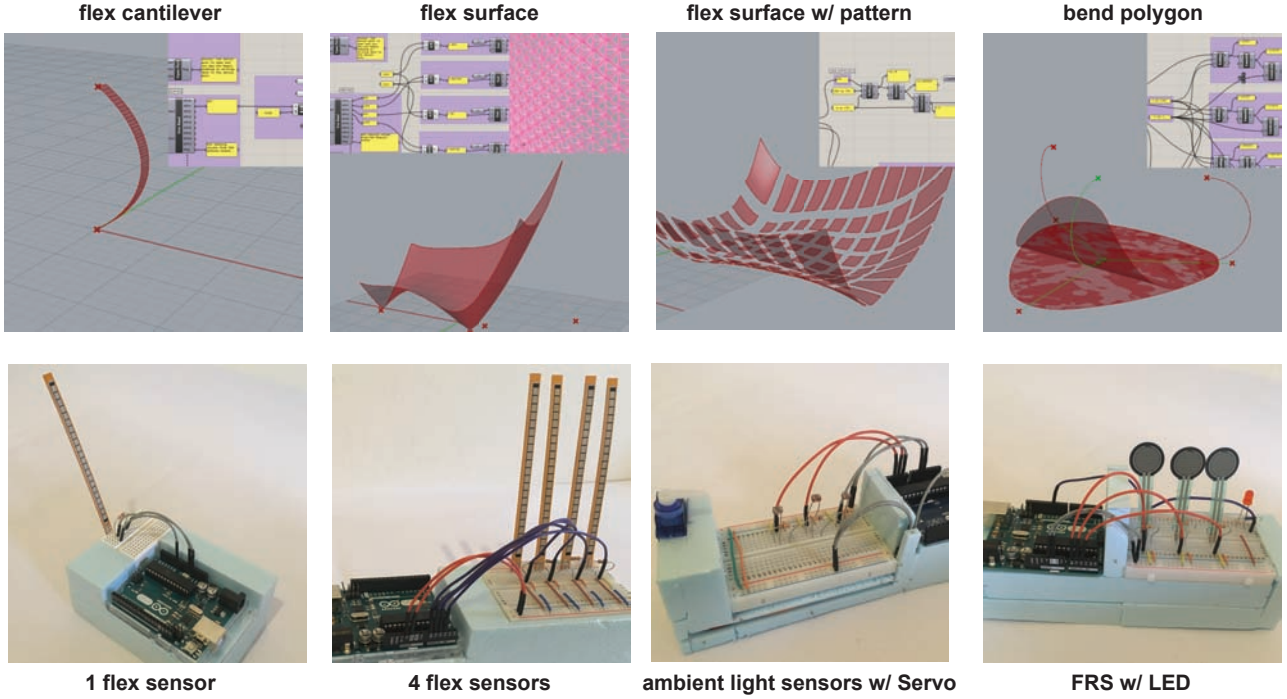
rbt_h0l: Hybrid-Minis

Informed by the above initial examination of physical-digital components and interface – the next step towards developing a hybrid physical-digital modeling technique, consists of a series of smaller experiments, referred to as Hybrid-Modeling Minis or Hybrid-Minis.

Four Hybrid-Mini experiments were tested, focusing on the ability of sensor data (physical) to affect the a digital object **[image 7]**:

- Flex Cantilever – uses a single flex sensor to generate a cantilevered form between 2 points located in Rhino
- Flex Surface – a digital plane is manipulated by a physical flexible plane with 4 built-in Flex Sensors
- Flex Surface with Pattern – this is similar to the previous experiment except the surface is a pattern – manipulated here by 3 light sensors. Also, a Servomotor is controlled by one of the light sensors– as a bit of fun.
- Bend Polygon – a polygon is bent using 3 Force Resistance Sensors (FRS). Also, a LED light is controlled by one of the sensors – as a bit of fun.

7. rbt_h0l_hybrid-minis - small initial experiments into hybrid physical-digital modeling technique



These Hybrid-Mini experiments are simple micro processor sensor models linked to basic 3D digital elements (mesh planes, surfaces, points, etc.) which test the ability for the physical/ analogue information collected by the sensors (flexion, pressure, light levels) to acting on, influence, articulate, and create digital objects. Thus these Hybrid-Minis begin to build a hybrid modeling technique whereby 'tactile' information can be translated into digital actions!

rbt_h0l: Hybrid-Mini - spatially significant findings

As *architectural design process* (analysis through making), the Hybrid-Minis revealed 3 findings with potential architectural and spatial relevance:

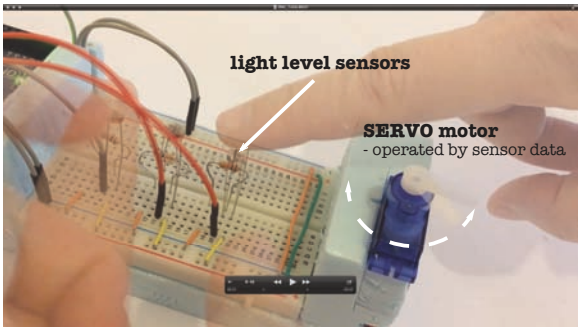
1. "seeding digital space"

All four Hybrid-Mini experiments use simple 3D digital elements (points, curves, surfaces, etc.) and link these to analogue sensor data through digital code describing what actions this data would take on the digital objects. Together, the simple 3D CAD elements (digital) and the data stream directed toward it (physical input), determines the digital figure/ form that is made. Therefore, and perhaps obviously, this hybrid technique is a combination of elements that exist half-in and half-out of digital space. Metaphorically, this technique can be seen as "seeding" a digital field (with digital elements), which are then acted on by forces (data streams) over time to 'grow' the resulting design object.

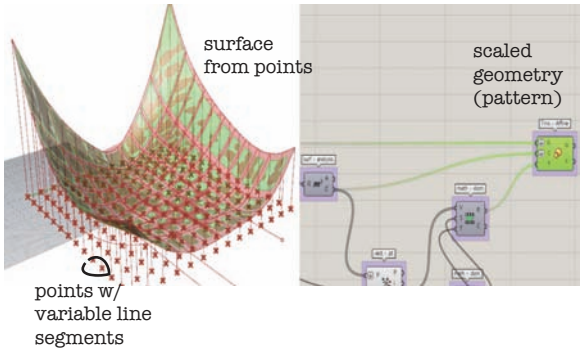
spatially/ architecturally this suggests: this presents a redefinition of object from independent, finite singularity to a spatial composition of rudimentary digital elements responding to designed data.

8. rbt_h0l_hybrid-minis *'force choreography'*

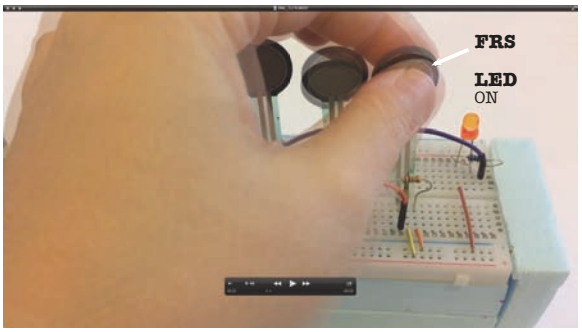
A1. light level sensors - data corresponding to **light** levels **shapes model**

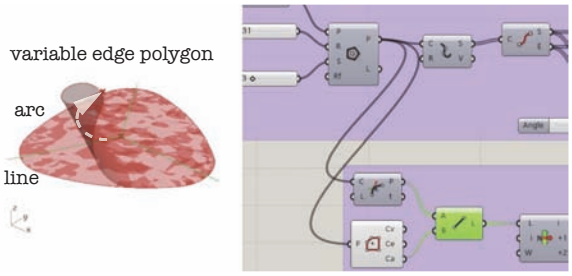


B. Rhino model - transformed by data run through code



A2. force resistance sensors (FRS) - data corresponding to **pressure** applied to sensor **shapes model**





2. "data mapping"
Analogue data collected by the sensors is in a 'raw' form; this meaning the sensor data from: light, distance, pressure, etc. come in as numeric values with many decimals and wide fluxuations. This 'raw' data requires mapping towards the desired affect on the digital figure, for example: a.) FRS sensors (force resistance sensors) responding to pressure send numeric values that are successively 'mapped' (made more regular) to be useful to the desired result: curving the edges of the polygon. b.) Flex sensors are bent, sending numeric values, which are then acted on by a divide component, translates the data into smaller decimal values, which determine the length of the line segment guiding the shape of the bent surface.
spatially/ architecturally this suggests: data mapping, or data design, is a significant "third" part of the hybrid architectural modeling technique, linking hardware and software.
3. "force choreography" **[image 8]**
The Arduino with integrated sensors explored in this research reads does not distinguish between force sources, meaning that sensor data from: light levels, distance, flexion, pressure, etc. is translated to numeric value and therefore the original source of the force (type of sensor) is interchangeable. This leads to the curious condition in which, for example, both light levels and FRS sensors (reading pressure) are able to bend/ or shape digital objects.
spatially/ architecturally this suggests: hybrid modeling does not recreate the one-to-one relationship experienced in physical model building, in which I cut and bend a surface. Instead in hybrid modeling light, distance, time etc. can be sensed together with tactile manipulations – to apply pressure or tension i.e. to manipulate digital form. Therefore man-made and naturally occurring forces with respect to architectural modeling can be choreographed to work together to design architectural form.

summary + future
The Hybrid-Mini experiments, as initial steps towards developing a broader hybrid physical-digital modeling technique, establish that some tactile control of digital objects is possible. Additionally, these experiments reveal data design to be a significant part of the hybrid modeling technique, such that between digital and physical methods there exists room to manipulate, design, and direct data; such findings potentially broaden the field of architecture in contemporary practice (to include data design) as well as begins to rethink basic assumptions (such as the definition of object).

It is these types of critical, innovative discoveries that underline the importance of *architectural design process* as a unique form of analysis through making (objects). As objects such analysis re-contextualizes the subject studied into a spatial and therefore architectural relevance – one capable of examining the scope of architectural practice and form-making while shedding new light into the relationship of digital era processes on contemporary architectural design.

While the focus of this research up to now has been on building a hybrid physical-digital technique/ apparatus/ Frankenstein's Monster, the next step will be the use of this technique in design while building on the lessons of this

such as:

- contrapposto applied to digital design – shaping the digital figure in (virtual) gravity
- shaping the digital figure through tactile/ manual engagement (through data sensors)
- and Hybrid-Mini observations: seeding digital space, data mapping, and force choreography

The objective then will be to examine how close this hybrid technique comes to forming a tactile relationship with digital design, thereby examining the effects of this hybrid technique on digital architectural design process (analysis as digital making) and thereforeour ability as architects to think critically through (digital) making.
If this research can be understood as searching for a technique that reconnects to working intuitively digitally – and, quoting Frei Otto who worked with both physical models and computer models:

> "... in computers you only find what you are looking for, but with free experimentation you can find what you have not sought." (Vrachliotis, 2016)

– it is the hope of this research, concerning the development of a hybrid modeling technique, to insert free experimentation into digital design.

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THIRTEEN WAYS OF LOOKING
REPRESENTATION AS AN ACT OF DESIGN

JENS PEDERSEN

1.0 Abstract

It is considered common knowledge that architects communicate information at different scales, such as 1:5, 1:50, 1:200 or 1:500, and that each scale has an associated level of detail, making the notion of representation and abstraction important aspects of architectural practice. This have been necessary since these have classically been communicated through drawings [1] or models, but today it is possible to have a high level of detail across scales with complex 3D models, 3D prints or photorealistic renderings. However, is this increased precision and detail necessary? And what are these technological advancements besides mere computerization of an already existing processes? Therefore, this early stage research wishes to ask the open question: "*can technology be pushed past representational use? Or will it remain a tool to augment the status quo?*". This idea is explored a sculptural series that have been developed based on theories found in cognitive and computer science.

Keywords: *Discrete geometry, digitally implicit, representation, data modeling*

2.0 Context

The project situates itself in the practice of architectural discretization, while acting as a comment to current practice of discretisation. Generally discretisation in architecture refers to the act of decomposing form into series of parts or components, making it possible to assemble complex form, where the resemblance depends on the number of pieces. This practice has therefore often been used by Zaha Hadid, due to the high formal complexity of their projects, where facades often are composed of several individual panels as seen in the Heydar Aliyev Centre, Baku or the DDP project in Seoul (fig 1). Any technical literate architect is able to read the modelling technique(fig 2) in the paneling of the DDP Seoul project. The great reveal is the valence 5 vertex as highlighted by a white dot in fig 1b, making it appear as if they have transposed the digital geometry into the physical.

This project aims to avoid this transposition of the digital by utilizing discretization techniques as a design approach, whereby the digital geometry becomes a scaffold from which design is derived. This will be achieved by implementing techniques found in cognitive and computer science as a way to study alternative discretization strategies than those found in architectural geometry.

3.0 Theory

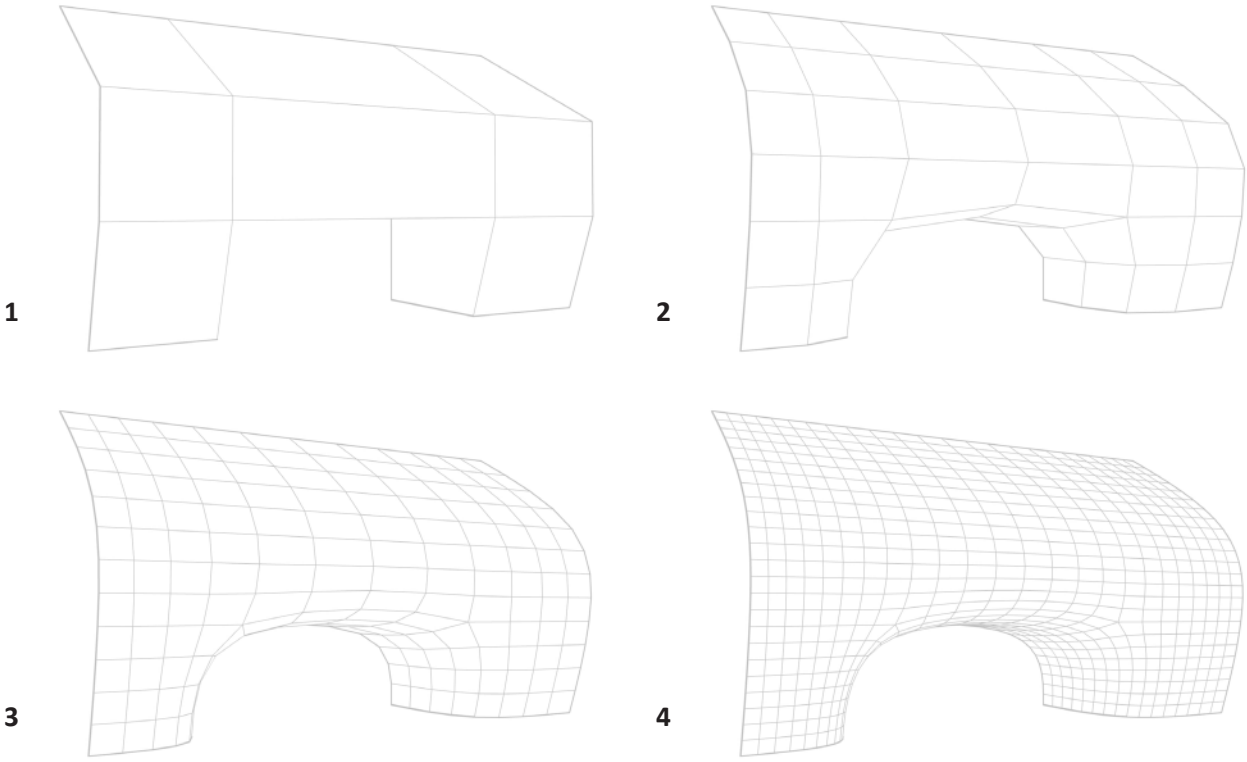
In cognitive science we find various techniques to identify objects in images or break objects into parts [2], and in computer science we find a similar techniques, where objects are clustered into parts as a means to identify center lines of point clouds [3] or meshes [4]. Common in both cases is the use of implicit information from geometry, which is possible to access through computational processes in computer aided design (CAD) software. Implicit information is the composite of digital objects that makes it possible for the computer to show them on our screens. In architectural research we find examples of this being used in design experiments such as the *neo-baroque columns* of Hansmeyer [5], or by CITA's *Inflated Restraint* project [6] (f ig 3).

Both projects aimed to make a material manifestation matching that of their high resolution digital model, which in the Inflated Restraint project lead to studies into how one can compare the physical to the digital. Ultimately realising it had not been possible to replicate the digital itself, but they were within a tolerable margin and could identify why it had not been possible to replicate the digital [6]. The columns of Hansmeyer ran into a similar problem of scale and resolution, since they had to rely on 3d printing technology or stacking of thin laser cut cardboard. Making the experiments look well from a far, but it was possible to read the resolution up close, something that is believed will be resolved in the future with technological advancements.

However, in the examples of cognitive and computer science the goal was inverse, it was one of simplification, which would make certain tasks simpler such as animation [4]. Therefore, it is the ambition of this research to explore this notion of simplification as a mode of design and method to build complex geometry. In cognitive science the curvature of objects are used to group objects into sub-parts [2]. however, digital geometry have more information ready available such as surface

a b

Figure 1: Image a) shows an aerial view of the DDP, Seul project. Image b is a zoomed in image near a pathway going under the building, the white dot hightlights a valence 5 vertex, meaning 5 edges meeting in a point, which is a sign of mesh modeling.



1 **2**

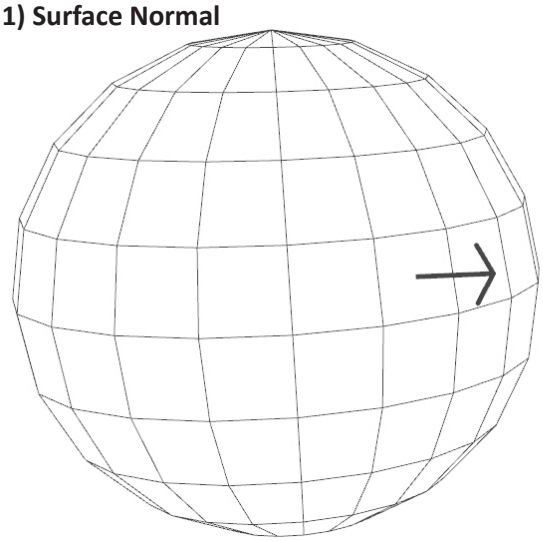
3 **4**

Figure 2: Images 1 through 4 shows the process of modeling the DDP, Seoul project, where the starting condition is 1) that is then smoothed to meet 4), the criticism is placed on the direct translation of 4) into physical space.

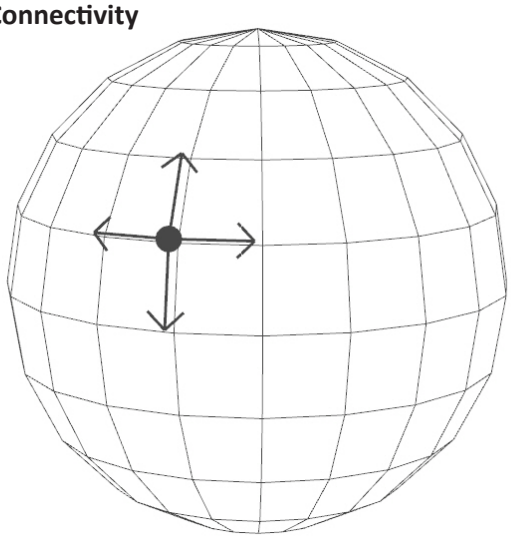
a b

Figure 3: image a shows the neo baroque columns by Michael Hansmeyer, where he used geometrical information to drive recursive subdivision of a set of base columns. Image b, is of the inflated restraint project from CITA, where implicit information was used to derive construction information. After construction it was evaluated through 3d scans to see how close it matched the digital.

1) Surface Normal



2) Connectivity



3) Topology

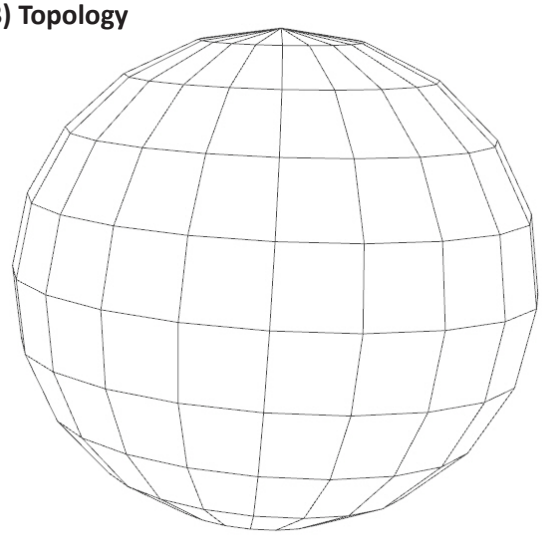


Figure 4: *1) normals,* a vector perpendicular to a surface, mesh face or vertex. *2) connectivity,* it is possible to access neighbouring information such as vertices or faces. *3) topology*, an object can change shape and still be topologically identical, but if number of faces or vertices change it will result in topologically different objects.

normals, connectivity or topology (fig 4), all of which can be accessed through computational processes. The aim therefore becomes to rethink the use of this information by making it a driver for design, pushing the process of discretisation past that of replicating the digitally made objects. This will lead to a process of form finding, not based on physical constraints but one of the possibilities latently hidden in the geometry, this approach has provisionally been labelled as object oriented design (OOD), and section 4 will describe more about the process.e process.

4.0 Experiments

This research was carried out using Rhinoceros and Grasshopper3d as its modeling environment, where Grasshopper3d is a parametric modeling software, that functions as an open environment that can be tailored to ones need, wherein it is possible to unfold the theory into two projects. Both projects were inspired by the poem “thirteen ways of looking at a blackbird” by Wallace Stevens [7], which, as it implies, describes different ways of looking at a blackbird through a series of composites. The notion of looking therefore plays an important role in the projects, begging the question: when breaking a complex object into smaller parts, when do we recognize the initial object? The starting point for this investigation is the same digital geometry as in the described Zaha Hadid project - meshes. One project acts as a calibration method, identifying potentials for the other project, additionally using the same geometry type, will make the projects linked and comparable.

4.1 Thirteen ways of looking at a sphere

The calibration project, *thirteen ways of looking at a sphere*, makes use of a sphere, as its basis of design. The sphere is grouped into parts based on mesh normals, connectivity and topology, it was chosen to not use surface curvature as a parameter, in spite of it being used a lot in cognitive science. The reason for leaving out that parameter is that spheres have constant both Gaussian and mean curvature throughout its surface [8]. As the name implies the experiment was structured around making 13 different spheres using the 3 different discretization parameters, where each parameter was used to 4 individual spheres, lastly one was made as a product of the 3 other spheres. The parameters were used to break the spheres into smaller pieces or groups by a generalized clustering method, named kMeans [9], making it possible to use data derived from a given shape to find alternative versions of it, which can still be considered to be the same as the original. Fig. 5 describes the process

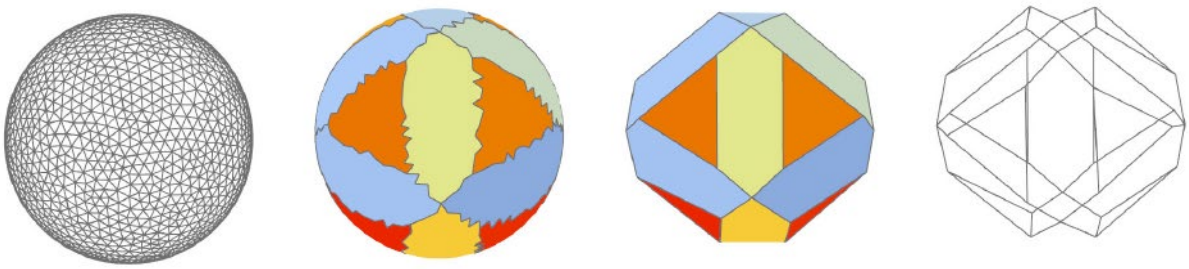


Figure 5: shows the process of going from complex geometry, to clustering and finally to a simple line network ready for fabrication as a result of discretization based on normals.

of grouping a sphere into parts based on mesh normals, which was clustered based on an initial seed of normals (fig 6). It was subjectively decided that using mesh normals as the clustering strategy presented the highest design potential since it blurred the reading of the digital modeling technique in the final geometry, see Fig 7 for a full range of designed spheres.

4.1 Three ways of looking at a sphere

The calibration project lead to the development of another project, three ways of looking at a man, which focused on discretization based on mesh normals as per the conclusions drawn by the calibration project. An interesting aspect that revealed itself from this method is that it allows emulate how an object would look from different angles and form a composite from it, resulting in a line or patch network (fig 5). This has the potential to instigate a conversation about from which sides is an object most recognisable and from how many side do one need to look at an object to recognize it as a whole, but more importantly it opens up new design avenues. This new layer, is also why the starting condition was shifted from a simple platonic solid to one of a higher formal complexity - a man (fig 8), but it maintained the same geometrical type. The project therefore serves as an exploration into the notion of OOD simplification through discretisation as a design idea.

As the name implies, this project consists of three different sculptures, where two are different and the third is the composite of the two (fig. 9). As mentioned these composites resembles different ways of viewing an object, which has to do with the nature of normal's of a surface, which are vectors and therefore indicate directions in space, when these are grouped into sub patches (fig 5), they start to resembled parts directly visible from a certain angle or view. Therefore the series becomes a composite image of a man that is build up through three sculptures, something our eyes and brain does so effortlessly on a daily basis.

4.2 Assembly logic

As part of the discretization process, was an element of rationalization was needed of the edges of the sub-groups (fig 4), since they were all different. This lead to a simpler fabrication and assembly process. Each group was reduced to a line network consisting of rod elements (pine sticks or copper coated welding rods), which were assembled by 3d printed nodes. All nodes had assembly information

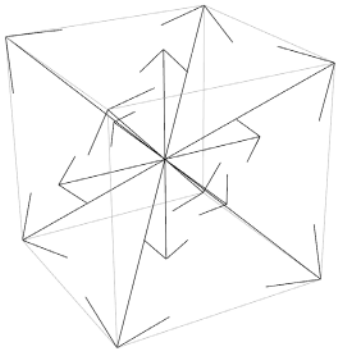


Figure 6: shows the normal directions used in Fig 4.

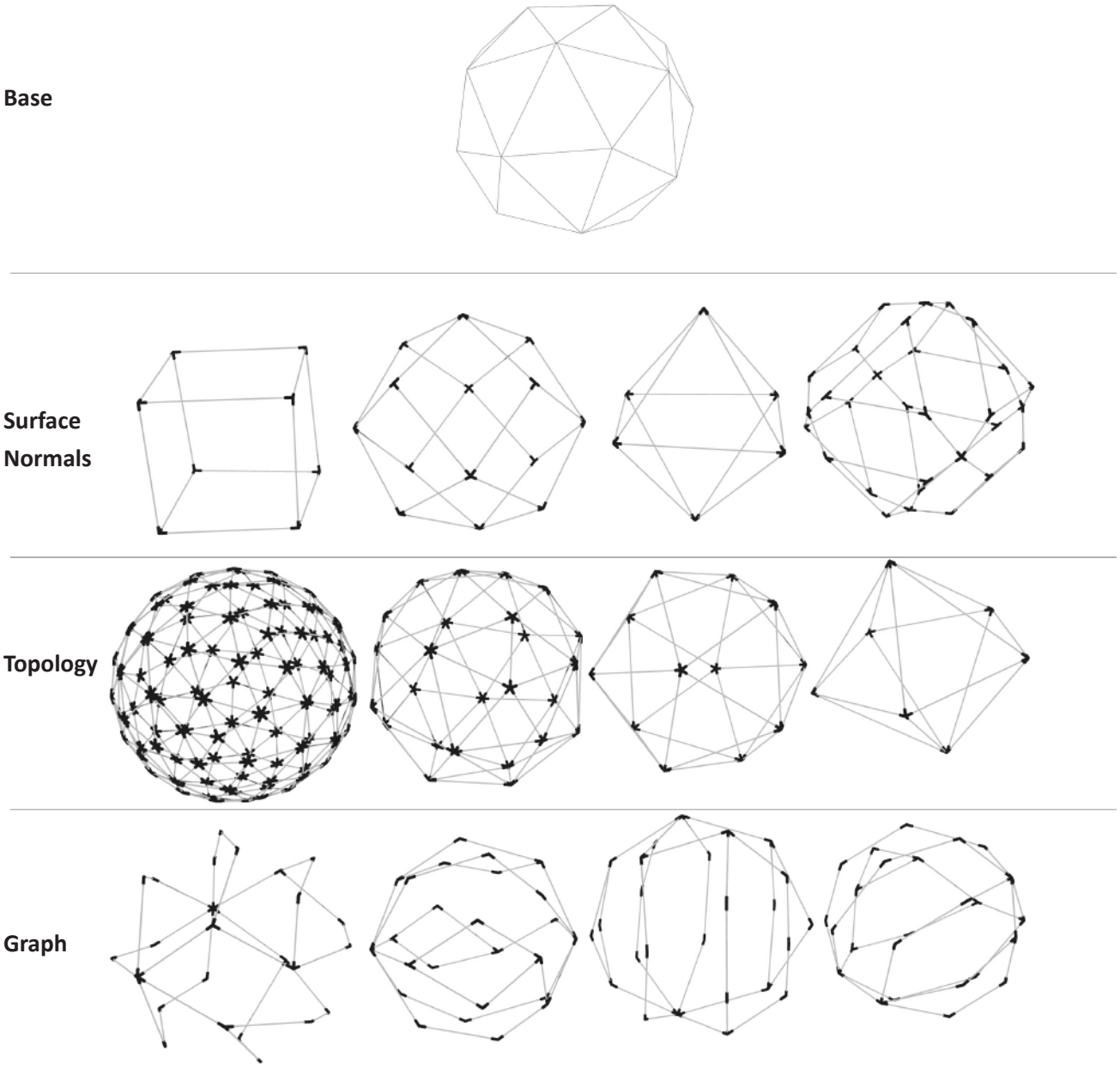


Figure 7: shows the 13 different spheres that were designed as part of the calibration experiment, the top row presented the highest design potential.

Figure 8: The base mesh and the process of grouping it into parts for further simplification.

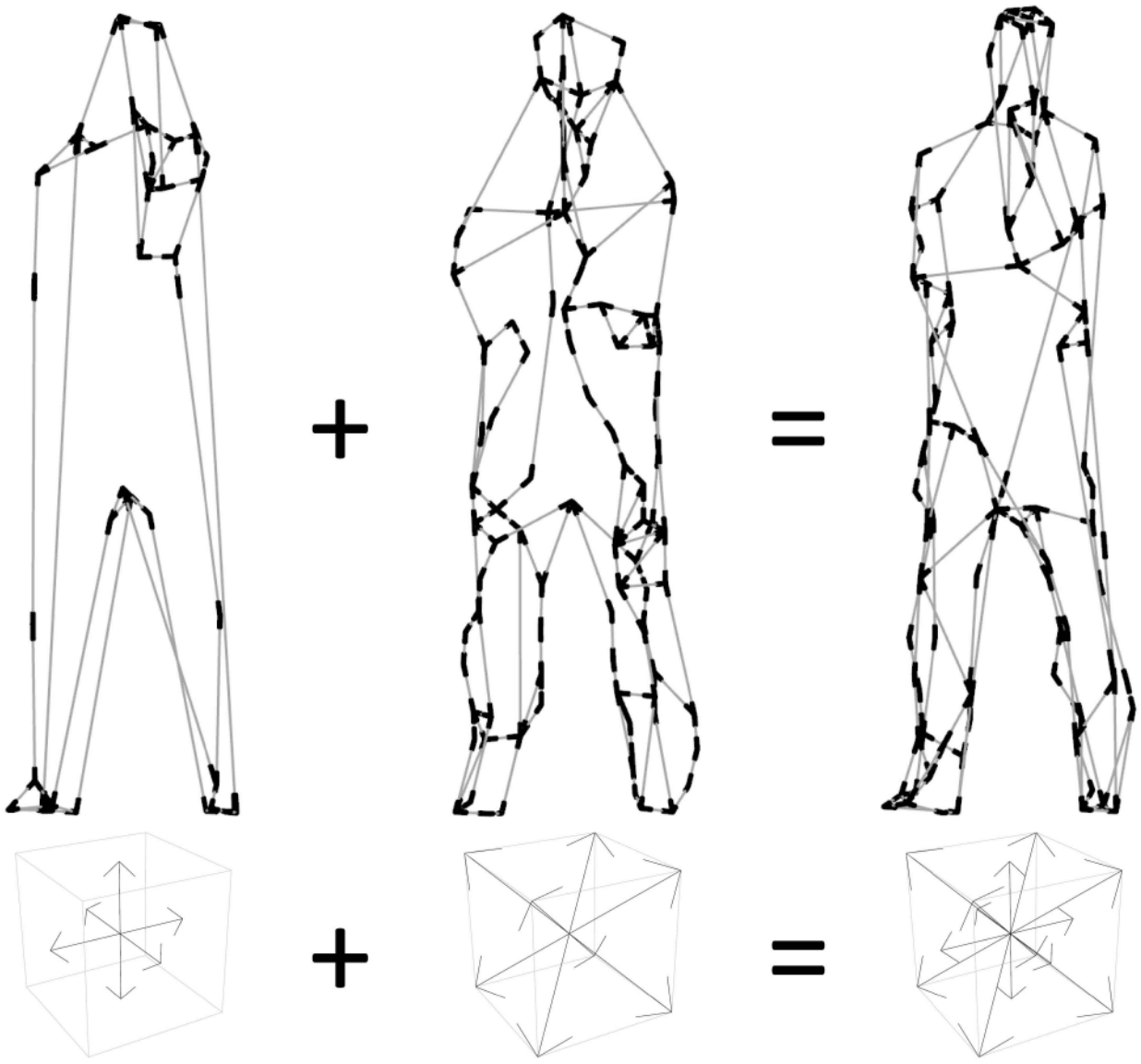


Figure 9: The three sculptures, where when the first two are merged they form a more holistic image of the digital base mesh.

printed on them (fig 10), meaning that they can only be assembled in one way, effectively making the structures into a big 3d puzzles or construction drawings.

4.3 Results

This subsection of the section 4 contains images of build pieces through fig 11 – 13, which are on the following pages.

5.0 Conclusion & Future work

The project presents a novel approach to design by utilizing computational techniques as a way to rethink the notion of digital representation, by making use of representational information as a design method. Through the projects series it was shown that this technique can uncover new space for design. Although the research is still within its infancy it presents new avenues of exploration within the field of computation in architecture and arts, where techniques such as 3D scanning and its high-res point clouds could be new subject matter to explore. This leap from using meshes to point clouds is possible since the method is flexible in nature, because it occupies itself with the grouping of data, making it useful in relation to any geometry from which data can be derived. There exist other examples of data related research within architecture, where the build experiments outlined

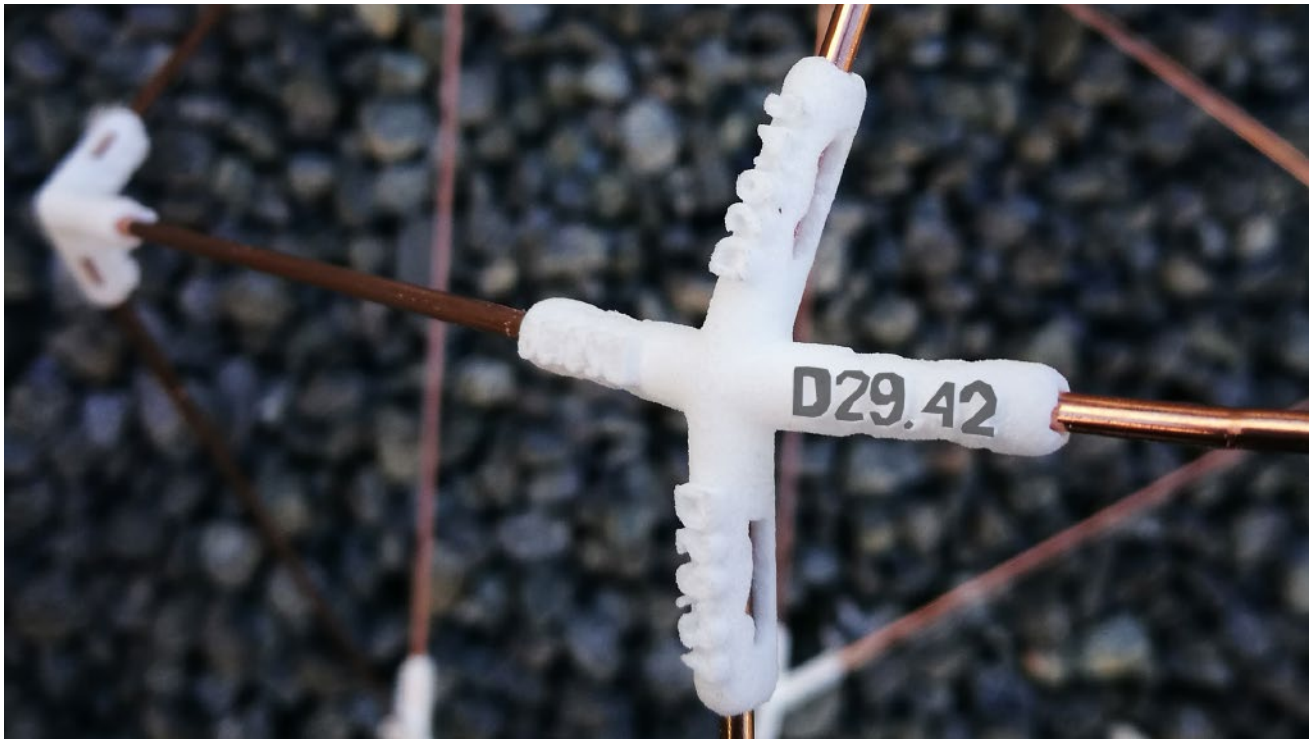


Figure 10: The numbering on the node reads out “D29:42”, where D denotes what sculpture it is part of, 29 the number of the leg and is printed on each leg of the node, and 42 speaks to which rod goes into the specific leg.

Figure 11: spheres build from the normal discretization method.

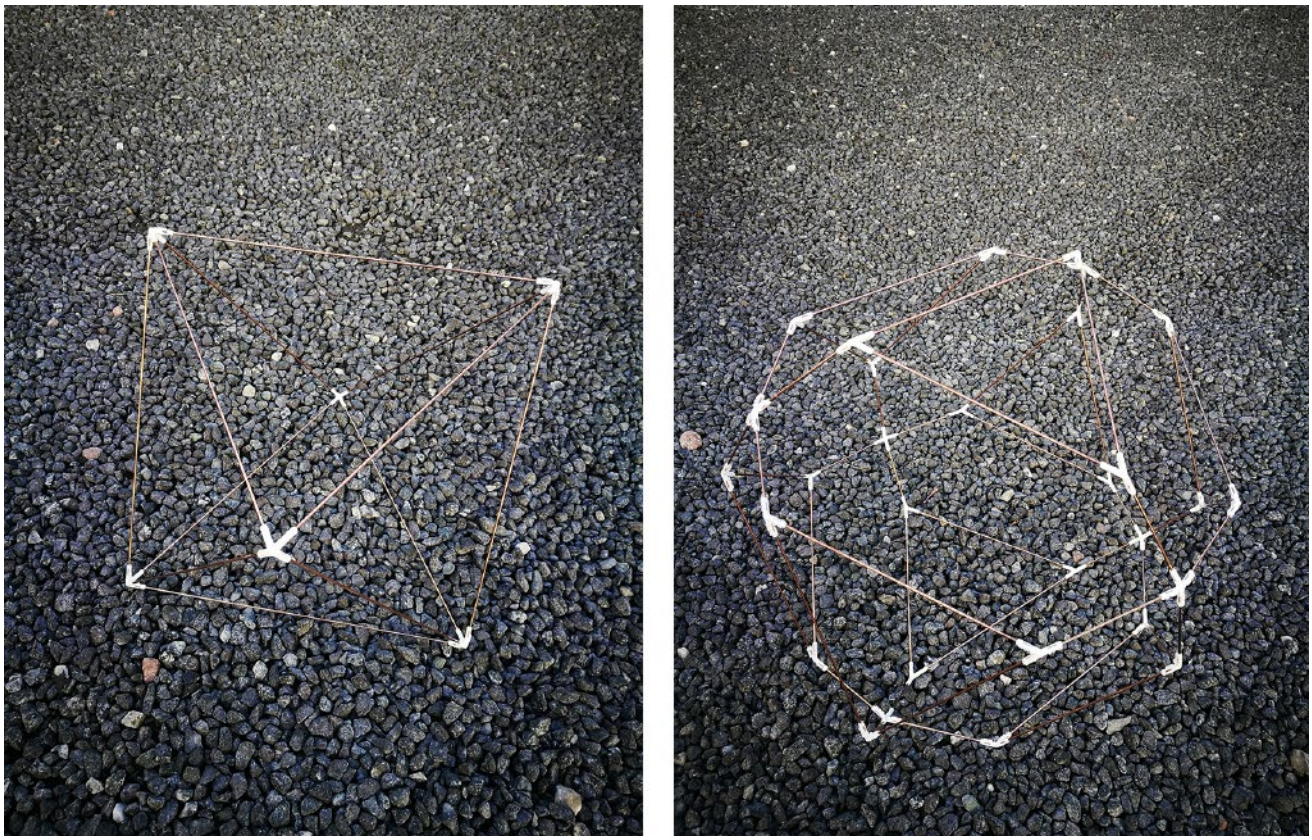


Figure 12: spheres build from the normal discretization method.

Figure 13: One of the ways of viewing a man based on the normal discretization method.

by Santiago R. Perez in his article titled Loss of Control [10] is of significance. He describes design experiments dealing with data shuffling that lead to unforeseen results in some design build projects. Another similar approach is the data bending described in the article Postdigital Materiality [11], where the simple 3d scanning technique – photogrammetry, is explored and manipulated, uncovering new ways of making form. Their use of manipulating data hints that the presented technique could be introduced into an already existing wider field of the post digital in architecture. Lastly the project proposes a future exploration of the technique relating it back to architectural practice, by applying the technique onto a complex surface geometry found in a build project. This future project will also contain the panels that would go in between the lines of the rod network, making the project add to the wider conversation of architectural components, and exploring the OOD paradigm as described earlier.

6 References

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[11] Abrons, E., & Fure, A. (2017). Postdigital Materiality. In Lineament:Material, Representation and the Physical Figure in Architectural Production(1st ed., pp. 185-195). Routledge.

7 Figures

Fig 1 : Author’s illustration, with images from the following websites:

- http://www.thegofever.com/architect-zaha-hadid/
- http://archiquality.blogspot.dk/2016/12/seul-corea-del-sud-open-dongdaemun.html

Fig 2 : Author’s illustration

Fig 3 : Author’s illustration, with images from the following websites:

- Neo – Baroque project: https://www.archdaily.com/138323/subdivision-michael-hansmeyer
- Inflated restraint project: http://www.complexmodelling.dk/?p=1379

Fig 4 : Author’s illustration

Fig 5 : Author’s illustration

Fig 6 : Author’s illustration

Fig 7 : Author’s illustration

Fig 8 : Author’s illustration

Fig 9 : Author’s illustration

Fig 10 : Author’s illustration

Fig 11 : Author’s illustration

Fig 12 : Author’s illustration

Fig 13 : Author’s illustration

MATERIAL FORM-FINDING OF MODULAR TEXTILE STRUCTURES

AGATA KYCIA

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Agata Kycia

KEYWORDS

3D printing on textiles, material form finding, hybrid textile structures, elastic modular assemblies, flexibility in architecture

ABSTRACT

This paper explores potentials of self-forming textile structures generated through 3D printing on pre-stressed fabrics. The need of more eco-friendly and lighter materials, more flexible designs and substantial cost reduction creates new possibilities for textiles as a construction material. New digital fabrication technologies such as additive manufacturing as well as development of highly engineered, programmable fibers allow for re-introducing textiles into the build environment as a lightweight, efficient and sustainable solution.

Proposed research focuses on potential applications of 3D printing on textiles while looking into modularity, variation, assembly logic and scalability. By introducing hierarchy into the 3D printed elements, various degrees of shrinkage are possible within one printed sample. Variable height and geometry of the printed filament allows local influence on the deformation of the fabric. This method enables precise control over the geometry and aims at minimizing the material needed for fabricating three-dimensional textile modules.

As additive manufacturing gradually becomes more affordable and textiles more and more robust, proposed methodology suggests potential novel applications for lightweight textile structures in the building industry.

1. INTRODUCTION

Textile structures have been used in architecture since humankind first began to build. Nomadic tribes from all over the world used fabrics to build shelters for themselves and their animals, taking advantage of their tensile strength, flexibility and adaptability.

The same characteristics, which led to the initial utilization of fabrics thousands years ago, nowadays have brought textiles to the forefront of innovation. Search for lightweight materials with high tensile strength and low carbon footprint contributed to the immense developments in the textile industry. New fabrication technologies, computer-controlled looms and knitting machines redefine the production process, while the development of highly engineered composite materials opens up the field of potential future applications. *“The cutting edge in architecture is not sharp, but sensuous and soft.”* [1]

2. TEXTILE STRUCTURES IN ARCHITECTURE

The purpose of the early nomadic textile structures was similar to the one of clothing: *“to provide privacy, environmental modification and protection, intended as a means of generating shelter when necessary rather than as enclosures of permanent space.”* [2] From these functional origins tents have gradually developed into recreational symbols of urban settlements such as theaters, shelters for circus troops or other public events.

The functional aspects of the textile structures reappeared in the nineteenth and twentieth century as reaction to the technological advancements in structural engineering. New construction methods enabled building first large scale tension-active structures where the overall geometry was informed by material tension. The world’s first hyperboloid structure (1896) by V. Shookhov and the doubly curved, pre-stressed saddle structure of the Dorton Arena (1952) by M. Nowicki are one of the first large-scale manifestations of the new structural aesthetics. Even though these projects were not built from the actual fabrics, they became the source of inspiration for the future textile structures.

3. MATERIAL DESIGN

3.1. HIGHLY ENGINEERED MATERIALS

Recent technological advancements and inventions on the molecular level of material composition revolutionize the world of materials, pushing the limits of scale and functionality. The everyday objects become smaller and smaller while their performance still increases. In the same time materials become smarter, lighter, stronger and more sustainable.
Similar tendency can be observed in the textile industry, where inventions of highly engineered fibers and yarns challenge the weight-to-strength ratio. New lightweight materials are produced with high tensile strength. Researchers and designers explore the new field of adaptive, phase-changing and living materials, being able to self-actuate and reconfigure. MIT Center for Bits and Atoms develop digital materials with programmable properties, continuously overcoming the limits of what is possible. [3]

3.2. MATERIAL FORM-FINDING

"Material design is a frame of mind. A deeper education unlearning one's first education. An attitude. Questioning. Inspiring: thinking, doing, and making." [4]

Early examples of designing through material behavior can be already seen in the hanging chain models of Antonio Gaudi [5], who derived catenary curves through gravity acting on interconnected strings. Other analogue examples are early form-finding experiments by Frei Otto, who used soap bubbles as means of expressing physical laws and studied the capacity of soap film to form minimal surfaces due to its surface tension. His material explorations gave foundations to the development of large-scale, lightweight, tensile structures such as the West German Pavilion for the Montreal Expo (1967) and the Olympic Stadium in Munich (1972). [6]

With the advanced computational design methods we are able nowadays to compute very complex forms and geometries faster, dynamically and more accurately. Moreover, we are able not only to digitally compute such geometries, but also to integrate a performance-based feedback and material constraints into the design process. In the context of the new technologies the role of the material in design attains a new understanding. Material becomes an active design driver and form generator. We are facing a perceptual shift, where "*materiality coexists with design in the form of explorative cyber-physical process".* [7]

Researchers from ICD/ITKE already implement such explorative design strategies by transferring biomimetic design principles and robotic manufacturing to fiber-based structures. Three full-scale prototypical pavilions test various aspects of utilizing coreless robotic winding methods for glass and carbon fiber reinforced composite elements. [8]

3.4. NEW PRODUCTION TECHNOLOGIES: 3D PRINTING

New digital production methods allow designers, architects and engineers to bridge between disciplines and look at projects beyond their categories. Such tendency can be observed in the progressive textile industry, which is increasingly influenced by technological advancements in the other fields.

Additive manufacturing has been one of the fastest evolving technologies in the last couple of years, continuously expanding the possibilities of fabricating physical objects. Various industries explore potentials of 3D printing by looking at different aspects such as scale, material or resolution. Construction industry for example uses robotics to overcome size limitations of the 3D printing machines. Researchers from IAAC developed a system of distributed small robots with various functionalities in order to print large-scale structures. [9] The fashion sector on the other hand experiments with 3D printing various materials directly on the textiles. The MIT Self-Assembly Lab for example developed the so called 4D printed textiles: the self-transforming structures that reconfigure into pre-programmed shapes, changing shape and function over time. [10] 3D printing becomes a more robust and increasingly affordable technology and has a lot of potential to be utilized in combination with hybrid textiles in the architectural scale.

5. RESEARCH DESIGN AND METHODOLOGY

5.1. RESEARCH OBJECTIVES

There are numerous examples of realized large scale textile structures which take advantage of their tensile strength and ability to economically span large distances, such as for instance the roof of the Hajj Terminal at Jeddah Airport (1981) or the 320 m diameter Millennium Dome (2000). However the majority of analogous projects look at textiles as homogenous, uniform membranes with given properties and they do not question the material properties itself.

Instead, the proposed research zooms into the micro scale of the fibers and the principles of the textile logic in order to explore different ways of introducing hierarchy and heterogeneity into the fabric structures. This search for diversity within one fabric is carried out by 3D printing on pre-stressed textiles and investigating the form-finding capabilities of created composite structures. Utilization of new fabrication technologies such as 3D printing in combination with highly engineered materials can create a ground for up-scaling textiles into innovative, revolutionary building solutions.

The research is carried out as a series of experiments, observations and evaluations in order to inform the design criteria and search for the unimaginable through discovery, surprise and error.

5.2. MATERIAL BEHAVIOR

The first series of experiments were developed during the 3D printing workshop at the ArcInTex 2017 conference, examining material behaviour and capabilities of the methodology as a form-finding tool. Experiments aim at optimizing a predefined 3D printed pattern in order to get a maximum deformation of the printed elements while maintaining the fabric in tension. All the tests use one arbitrarily chosen pattern as a base to find the right pattern proportions.

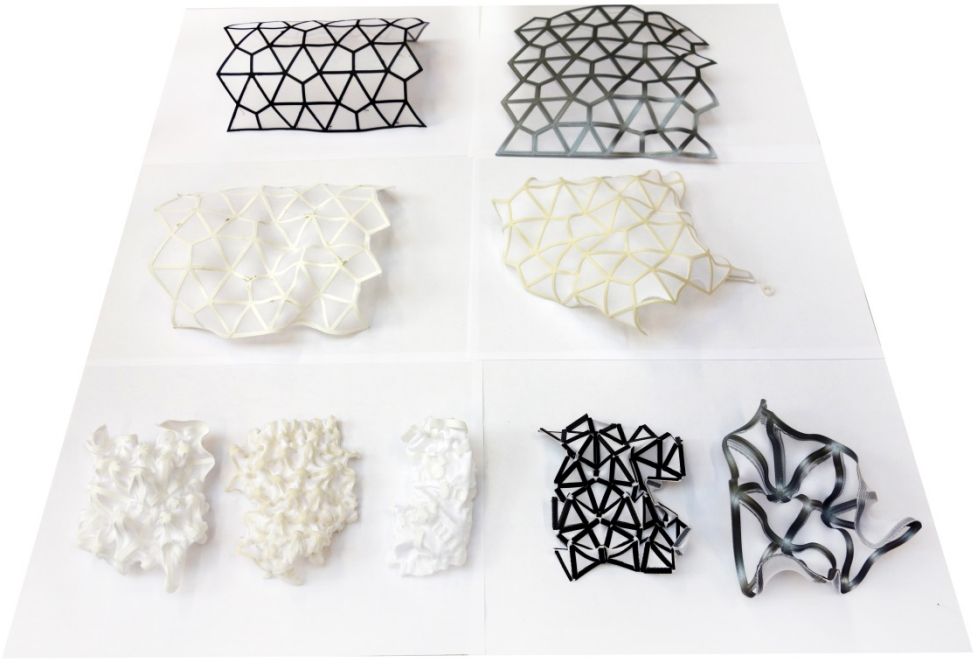

Fig.01. Collection of material tests and various self.-forming behaviors

5.2.1. Set up

Height and width of the pattern are being alternated until the assessed outcome is reached. For the record and comparability of the tests, all the other parameters remain unchanged: the type of the fabric, pretension,

speed and temperature of the print.
The overall pattern fits in a square of 18,5 x 18,5 cm and consists or triangular and rhomboid shapes with an average edge length of 4 cm. The fabric consists of Polyamid (80%) and Spandex (20%) and it is stretched by 200%. Using the fused deposition modelling 3D printing technique (FDM), two types of filament are tested: PLA (polyactic acid), made from organic and renewable sources) and TPU 95A (thermoplastic polyurethane) - a semi-flexible and chemical resistant filament with strong layer bonding. All the models are printed with a 0,4 mm nozzle and the nozzle temperature of 195 degrees Celsius.

5.2.2. 3D printing method

The process begins with attaching the pre-stressed fabric onto a glass plate and placing it in the 3D printer. The height of the plate is then adjusted in such a way that the first printing layer attaches to the fabric but does not burn it. Once the print is finished, the glass plate is removed from the printer and the geometry is carefully cut out from the fabric.

5.2.3. Observations

Final deformation of the fabric turned out to be affected by several additional factors. One of the significant aspects was the time when it was cut out of the fabric and released from the tensioned plate. The later the print was cut out, the smaller the deformation.

Another important parameter was the attachment of the fabric to the plate. In the numerous tests the fabric loosened itself from the plate during the printing process. As a result, the first layer ended up being slightly shifted in relation to the other ones, affecting the precision of the print.

This series has finished with a 3D printed prototype with the following specifications: Material: elastic PLA, Fabric: Polyamid (80%) and Lycra (20 %), edge width: 2,5 mm, average edge length: 3,1 mm, height: 0,6 mm – 3 printing layers, nozzle: 0,4 mm, printing temperature: 195 degrees.

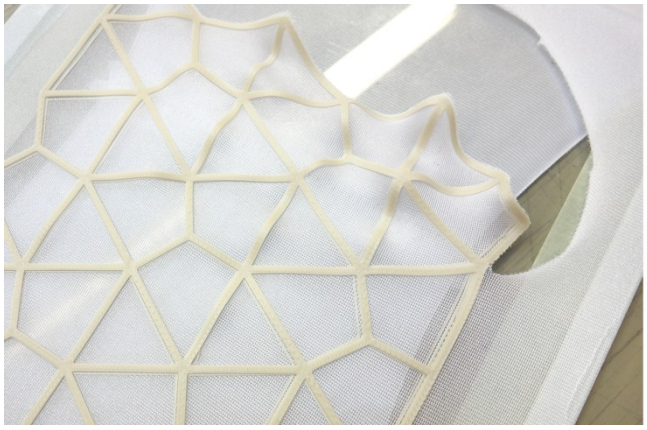

Fig.02. Releasing fabric from the plate

Fig.03. Resulted textile structure

5.3. MODULARITY

Once the material form-finding method of the desired hybrid textiles has proved to work, new questions arouse, one of them addressing the topic of modularity. Consequently, the next series of tests looked at the individual modules and their potential to create bigger assemblies.

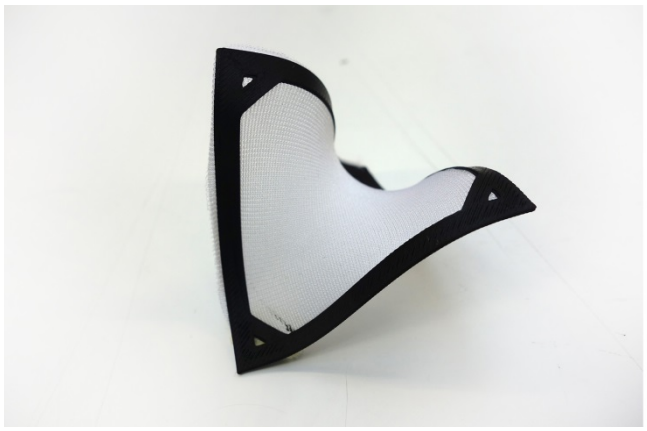

Fig.04. Single module

Fig.05. Modular assembly

The initial experiments started once again with the search for the right proportions and sizes, this time for an archetypal square module. The first tests consisted of 6 x 6 cm modules with connection elements in the corners; however it was difficult to compare the results and draw the conclusions because the overall size was too small and inaccuracy too big. The refined, enlarged module had the dimensions of 18, 5 x 18, 5 cm with a 5 mm edge width and 0,6 mm height and it became a base for further explorations.

Next series of models tested different dimensions and proportions of the printed edges by alternating the width and height, introducing abrupt transitions versus gradual transitions and integrating hollow spaces as placeholders for potential connection elements.

Another round of tests distorted the initial geometry of the square into a quadrangle with two extended edges in a way that all the vertices of the figure lay in the corners of a regular square, once the structure has found its final three-dimensional shape. Geometry of such module can be accurately controlled, multiplied and assembled into a larger construction.

Fig.06. Three modules of 18,5 x 18,5 cm each with various 3D printed edge thickness (left: the same thickness of all the four edges: W: 5mm, H:0,6mm , middle: two edges W: 5mm, H:0,6mm and two wider ones: W: 15mm, H:0,6mm, right: 2 edges W: 5mm, H:0,6mm and two higher ones: W: 5mm, H:8 mm)

5.3.1. Observations

Through a series of trial-and-error experiments it became clear that the behaviour of the hybrid textiles can be controlled with a relatively big degree of precision and accuracy. It is possible to integrate planar elements into the free-form textiles and design the transitions between rigid and flexible areas, what opens up a vast range of possible applications. Structures with different degrees of elasticity, stiffness, strength and porosity could adapt to different contexts and conditions.

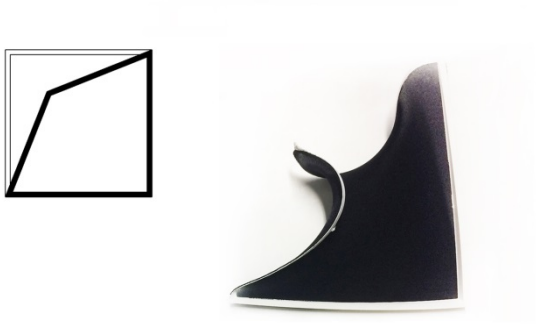

Fig.07. Module with 4 equal edges

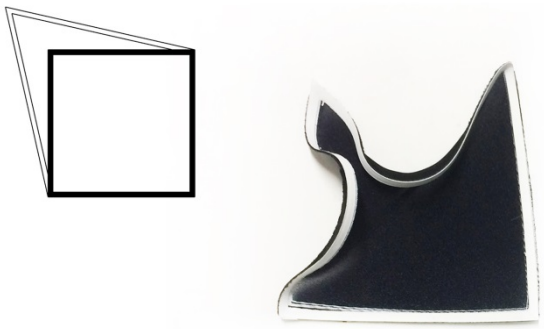

Fig.08. Module with 2 longer edges

One of the questions that arose during the production process addresses the basic definition of a module. Could the textile construction logic as well as the 3D printing methodology inform and redefine the idea of a building module? How different could a textile building element be comparing to the rigid, standardized brick units or concrete blocks? Could we take advantage of the flexibility of the material to create continuous textile modules for soft spaces?

5.4. HYBRID STRUCTURES

The following experiments aimed at introducing hierarchy between the individual elements within a single print. The first pattern is inspired by the dragonfly wings – a structure driven by performance and material efficiency, which consists of thinner and thicker elements depending on the function that they have. For this experiment an analogous pattern was simplified to elements with three different heights and three different widths. Due to the over-dimensioning of the elements, the overall deformation turned out to be minimal; however one could observe local differentiations.

Fig.09.3D printed pattern with three different edge dimensions

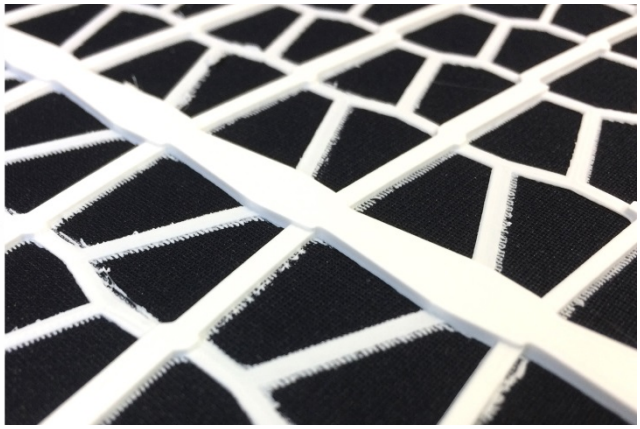

Fig.10. 3D printed pattern with three different edge dimensions

Another series of prints used a regular triangular grid in order to compare its different iterations: one with all the elements having the same proportions and its derivatives with variable heights. The first homogenous pattern was printed with uniform filament dimensions and resulted in a regular, repetitive doubly-curved textile structure.

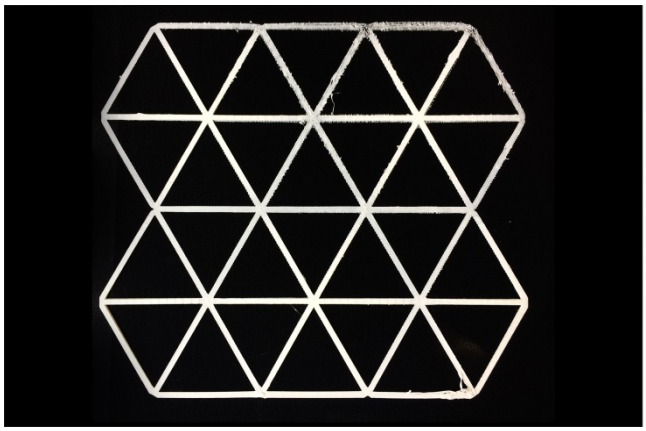

Fig.11. Regular triangular pattern with equal height

Fig.12. Resulting geometry

The second print was based on the same geometrical pattern, but the height of individual elements was gradually increased towards certain areas, reaching a high point in every second vertices. As a result, the print deformed very differently, creating a heterogeneous structure with stiffer regions and more flexible in-between spaces.

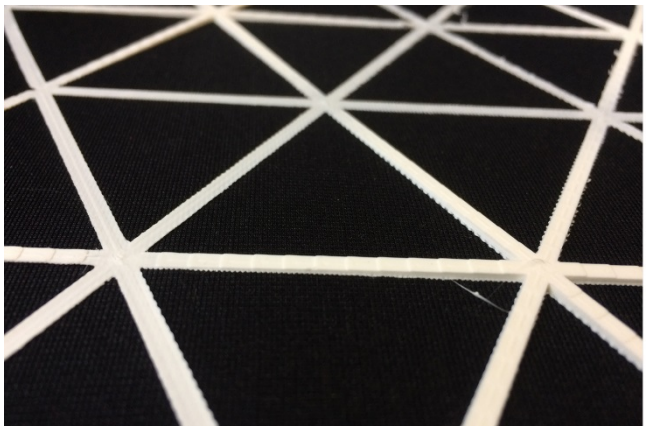

Fig.13. Triangular pattern with variable edge height

Fig.14. Resulting geometry

Fig.15. 3D printed sample with a gradual height change

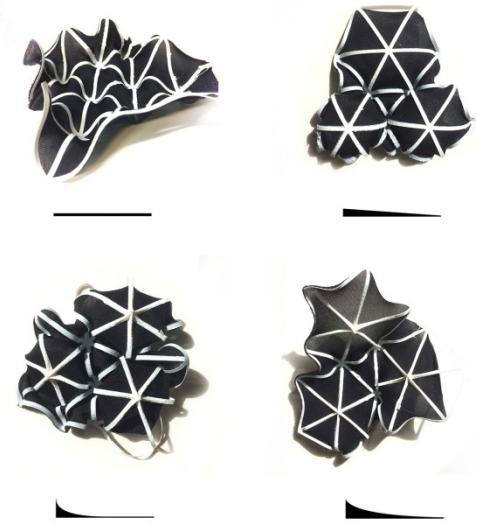

Fig.16. A sequence of four different samples

Last two examples incorporated the non-linear height difference, what significantly affected the deformation. New pattern formations emerged by stiffening only half of the edge length and leaving the other half flexible. The stiffer areas were naturally pulled together, while the more flexible areas formed another in-between layer. Resulted system suggested potential applications as performative structures that open and close by pulling apart the stiffer elements and stretching the in-between zones.

5.4.1. Observations

Presented examples indicated the robustness of the proposed method and its potential to locally influence the self-forming behavior of the textile. Diverse qualities can be reached within one fabric by simply changing the parameters such as the height of the 3D printed filament or by introducing hierarchy between the elements. Such principle could be further studied a tool for material and structural optimization, enabling to create textiles with different properties without the need to introduce multiple materials or other manufacturing methods.

It's often errors and experiments that become sources of inspiration for the next tests. In one of the samples, a couple of weeks after printing, the filament started detaching from the fabric in certain areas. This gave rise to the following question: Could we use the fabrics only as an in-between product that steers the shaping process of other materials?

Another study inspired by the 3D printing error the so called "printing in the air" – printing porous geometries without the support, which locally detach from the fabric and result in another layer of fibrous constructs..
Could such fibers function as stiffening elements for the hybrid composites?

6. EVALUATION

The series of diverse experiments demonstrated potential of the proposed methodology for creating hybrid textile structures by 3D printing on pre-stressed fabrics. By taking advantage of the elasticity and adaptability of the fabrics we can fabricate complex, three-dimensional geometries without the need to design and model them in three-dimensionally beforehand. Instead, these textile structures can be developed by printing flat and controlling the way they shape themselves through surface tension. Such manufacturing process allows to skip the 3D printing of the support structures (which are necessary when printing directly in three dimensions) and as a consequence leads to significant material savings.

In the same time it also became clear what are the current limitations of currently available technologies and what other remaining problems need to be solved. For up-scaling the current findings, the notion of scale needs to be addressed, both in terms of the used materials and fabrication technologies.

8. CONCLUSION

As construction becomes increasingly digital and design more physical, the objective of this project is to re-introduce craftsmanship and materiality into architectural design and provide novel applications for lightweight textile structures in the building industry.

The proposed methodology of 3D printing on pre-stressed fabrics has shown a lot of potentials when considered a new construction process. Being an efficient and lightweight solution for spanning large distances, it has also numerous advantages for transportation and assembly. Since the textile components are printed flat, they could be also transported as flat sheets and installed in their final form already on site.

Moreover, it is also a method that allows to 3D print three-dimensional complex geometries without wasting additional material for support structures, usually required in such processes. As relatively inexpensive and efficient method to create three-dimensional geometries, it could be also utilized as an in-between product such as the formwork for shaping other materials.

The part of the investigation that is still remains a challenge is the up-scaling of the production process, however with recent technological advancements and material innovations, there is potential to overcome current limitations and suggest new solutions for the building industry. The next phase of the research will focus on the creative use of the additive manufacturing process by looking at custom 3D printing paths, resolution and continuity of the material deposition.

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10. LIST OF FIGURES

Fig. 01 –Fig.05: own figure, ArcInTex 2017

Fig. 06 – Fig.16: own figure

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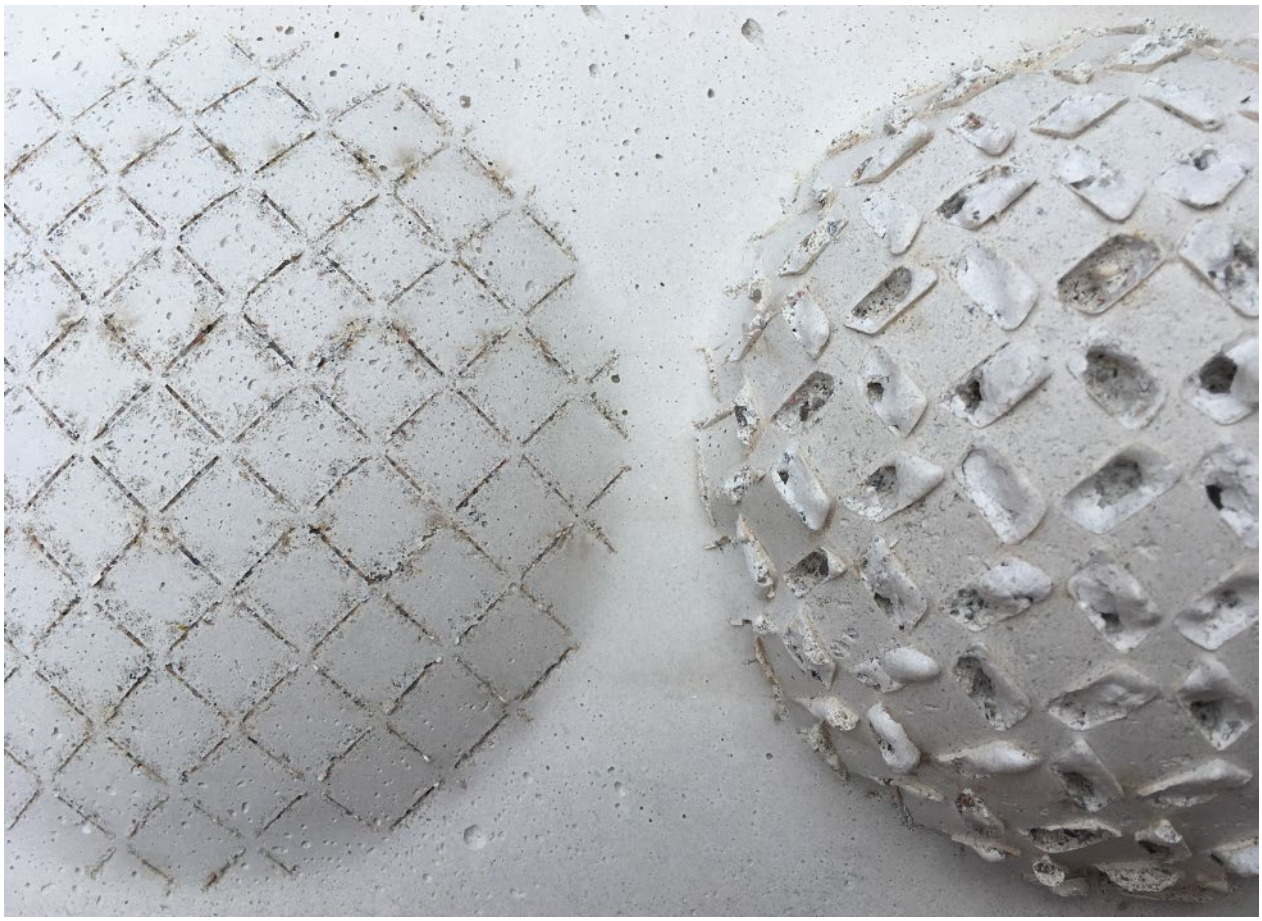
UNPREDICTABILITY AND DIGITAL CRAFT: CULTIVATING A MATERIAL INTUITION

ENGAGEMENT WITH PHYSICAL MATTER AS KNOWLEDGE BUILDING IN ITERATIVE EXPERIMENTATION

JON ENGHOLT



Unpredictability and Digital Craft: Cultivating a Material Intuition

Engagement with physical matter as knowledge building in iterative experimentation.

1 Abstract

This project studies unpredictability in digital fabrication processes manifested through the material properties of concrete.

The translation of design intent into built form plays a central role in architectural design, both historically and today. Drawing and manufacturing software (CAD and CAM) embodies and maintains both an ability and an imperative to build with extreme levels of precision, control, and predictability. Most applications continue the lineage of traditional design processes focusing on representation and geometry rather than integration with material capacities. Some contemporary practices and research in material motivated computational design and fabrication strive to embed such capacities in strategies of material formation, maintaining an imperative to predict and control. Such a complex understanding of geometry, fabrication, assembly, and installation encapsulates a hybrid notion of *digital craft* as not only knowledge about techniques, but also – and more importantly – judgment in conceiving material processes.

The paper discusses how knowledge evolves and affects the design of physical experiments, pursuing the internal logic of the building material rather than the formal logic of the design system. This pursuit cumulatively adds to the available information in the design process and thus continually transforms the

predictability of each experiment. The role of unpredictability in digital craft thus intimately ties to the evolving judgment of the researcher as a designer. The design experiments presented in the paper constitute the first series of physical investigations in the PhD project. As these initial investigations are all small scale and thus detached from an explicitly architectural context, I attempt to allow and pursue qualities in the concrete cast that might otherwise be discarded. Through gradual refinement, this first series aspires to suggest possible tangents of experimentation that might evolve into propositions in an architectural scale of 1 to 1.

2 Introduction

Researching by design while relying primarily on not only physical experimentation but also clear navigation in expected and unexpected outcomes, the relation between designer and experiment assumes a significant role. The idea of engaging material studies from a craft position involves a holistic acceptance of the intuitive knowledge of the designer but begs the question of how this knowledge manifests as research. In addition to describing the experimental work and positioning it within a research context, this paper thus discusses how I as designer and researcher navigate unpredictable outcomes. In this paper, I initially contextualise the research within relevant discussions in digital fabrication and the role of concrete in this context. Further, I describe and evaluate a series of physical experiments, and conclude with reflections on the process of experimentation and potential further developments.

3 Contextualisation

3.1 Designing Material Behaviour

Digital manufacturing tools change how we perceive and experience the architectural design process as they proliferate in both architectural practice and research. While drawing software remains comfortably inside the classical paradigm as a means of representing geometry, digitally controlled machines for fabrication allows the designer to engage intimately with the material process. This process involves not only directly manipulating physical matter but also understanding material capacities, organising individual elements and generating digital geometry. As designers and researchers have mastered generative and fabrication tools, the focus has in recent years shifted towards understanding the role of material behaviour in digital design strategies. Fabio Gramazio and Matthias Kohler outline this role in the term *digital materiality*. The term encapsulates the interwoven relationship between virtual and physical, recognising that the conception and the making of design cannot be separated: The physical output is not a manifestation of designed geometry, but rather the result of a complex negotiation between data and material. Recognising this negotiation as a fundamental condition, the role of the architect changes: The architect no longer merely designs the physical object; the architect designs the production process itself (1). Digital materiality emphasises the knowledge of material capacities, processes, tools and techniques; knowledge that is intrinsic to the classical notion of craft. The term thus frames a recent position of the architect as maker and craftsman through the application of digital manufacturing tools. These tools - apparatuses of logic and mechanical machining - become the platform for an intuitive relationship between architect and matter genuinely motivated by understanding material behaviour.

While this attitude indeed encompasses the dynamics of digital making, it departs from manufacturing and computing rather than material studies. Digital materiality emphasises the similarities between the logic of construction and the logic of programming: Both logics are comprised of individual sequential steps towards an assemblage of parts. However, this implies a reductionist approach to materials as logics of construction, hinting at an agenda of understanding materials as mere mediums of manipulation and control – not as mediums of intuitive physical experiences. Material understanding thus becomes a

question of reducing material properties to data in the design of predictable manufacturing processes. However, craft explicitly transcends the notion of predictability as an essential distinction from industrial production. Traditional craftsmanship encapsulates a relation between maker and artefact, where the process of making – or the workmanship – itself contains an openness and vulnerability through the dependency of craft. David Pye recognises this vulnerability in his distinction between *the workmanship of risk* and *the workmanship of certainty*, acknowledging that some material qualities can only reveal themselves through the risky care and judgment of a skilled craftsman. The outcome of the process is 'continually at risk' (2). Pye contrasts this risk with the certainty in repetitive industrial production, a certainty that predetermines the quality of the product. Within research in materially motivated digital fabrication, it might thus be pertinent to discuss not only how material behaviour might inform design strategies, but also how to acknowledge physical engagement as something beyond probing and control. As a term embracing the embedded role of unpredictable and unexpected outcomes, this attitude is recognised in the holistic understanding of *digital craft* (3).

3.2 Concrete and craft

Concrete permeates modern building cultures as the single most consumed material worldwide after water, and thus epitomises a culture obsessed with regulation and control. In industrialised building cultures, the material is primarily a technological product where manufacturers produce reinforced concrete with extreme attention to performance in assembly details, surface quality and aggregate ingredients. This focus on control is the exact mechanism that prevents novel techniques and forms to emerge – techniques and forms that might exhibit sophistication in intuitive experience rather than structural performance (4). Conversely, in developing building cultures concrete has become the new material for the unskilled builder and anybody with gravel, cement, a bucket and a bit of formwork can erect a sturdy structure. Concrete thus represents split perceptions between, on the one hand, high-tech industrial application and, on the other, untrained manual labour (5). However, neither of these extremes or the spectrum in between, prioritises the conscious, experienced and dedicated material manipulation that characterises craft. As craft primarily constitutes the historical traditions associated with pre-industrial materials such as wood and stone, concrete as a modern product has a limited history of craft. This lack of tradition, however, does not exclude studying the material from the point of craft and design processes based on fundamental material properties. Concrete exhibits two essential properties: The transition from fluid to solid form and the immense weight of the material. Weight and fluidity thus act as the key contributors to form in the process of negotiation with the formwork. My experiments seek to investigate processes of designing conditions for how the material is shaped, and explore how these conditions might cause unpredictable effects in the physical cast. A part of the experiment design is thus to identify where and how the unpredictable might occur.

3.3 Physical negotiation: Material and technical unpredictability

The casting process negotiates between concrete and formwork – material and technique. The concrete pushes against the formwork, strenuously attempting to keep the concrete from seeping out. If allowed, the concrete escapes its confines and acts according to its composition of raw materials; it flows and distributes in whatever manner this composition dictates. This unpredictable behaviour is tied to the interior – or material – circumstances. Conversely, the concrete affects the formwork, that might deform under the immense weight of the material. This unpredictable deformation relates to circumstances exterior – or technical – to the concretes. The main consideration in designing the experiments thus lies in where to explore unpredictability and how it might evolve, in a spectrum between unpredictability in the material and unpredictability in the technique.

While unpredictable outcomes of the casting process might add to the intuitive, aesthetic and experiential value, they challenge a fundamental architectural premise: To assemble architectural parts, they need to be precise. However, the experiments discussed in this paper focus on intuitive engagement with matter and form as part of an initial series of experiments and do not represent generations of refinement.

3.4 Digital negotiation: Virtual and physical form

Precision arises from control. Yielding control in favour of material capacities, letting concrete and formwork negotiate the final form during the casting process, thus creates circumstances of imprecision. Control, however, is a static term that barely accounts for the dynamics of this negotiation; what might better address this process is a notion of apprehension. Although apprehending the dynamic behaviour of the material process does not extend to precise prediction, it might allow me to understand the process better and thus partly relinquish the need for control. With the physical casting as input, digital software can apprehend the physical behaviour through simulation. The physical process thus teaches the simulation, that conversely learns to apprehend the physical form. What might initially be an unpredictable or even undesirable result of the physical process, can thus mature as an integrated part of the process design. I intend to further develop the presented experimental work through iterations of feedback between virtual and physical form, incorporating unpredictable effects into the dialogue. However, since this work is at an early stage and assumes a technical character, it is not included in the present paper.

4 Experiments

4.1 Experiment design

The concrete experiment series investigates a position between material and technical unpredictability, where parts of the final form, on the one hand, emerge through formwork deformation and, on the other hand, through concrete flow. I designed the formwork to exhibit three degrees of predictability: A rigid component in traditional formwork, a flexible component in rubber and a 'material' component of cut patterns in the rubber, allowing the fluid concrete to escape through the membrane (fig. 3).

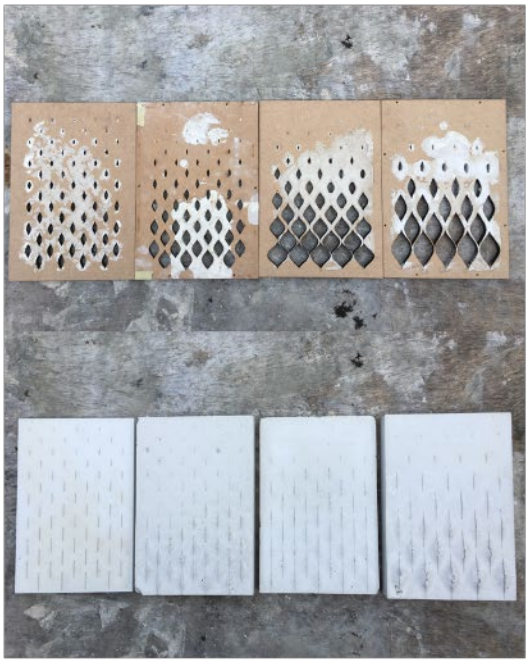


Fig. 1 and 2

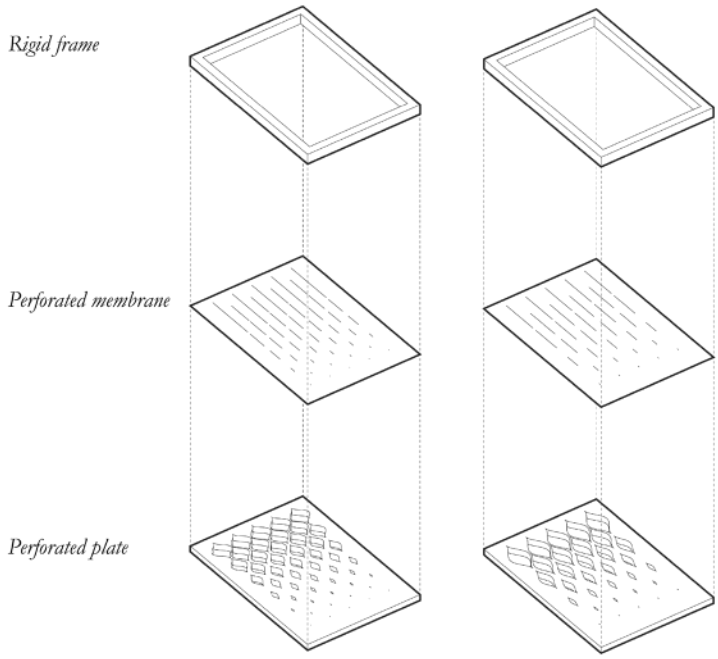


Fig. 3

These formwork components respectively reflect precise control, predictability in the technique and predictability in the material. I initially imagined the weight of the concrete to have a significant impact on how the rubber membrane formed openings through which the concrete would flow. While I achieved this within a few iterations, the formwork deformation tied to the perforation pattern did not add substantially to the overall form (fig 1 and 2). I thus turned to a more radical approach to the balance between formwork components.

The following experiment iterations depart from studies in perforation patterns in metal that create local capacities of deformation (fig. 4 and 5). Locally applied pressure can distort the flat surface, forcing gaps to form from the linear cuts through the metal. However, since manipulating metal is an irreversible operation - it does not return to its initial flat form by itself – any specific distribution of perforations presents countless possibilities for the final form. The rigid material can be pushed and contorted arbitrarily, leaving an open design space even after cutting the metal.

Fig. 4

Fig. 5

However, if a perforated sheet were subjected to isotropic pressure, the material properties, perforation distribution and external pressure would be the only agents negotiating the final form. Employing concrete as the pressure agent and choosing rubber as a malleable formwork material thus allows me to trace design modifications from flat rubber sheet to three-dimensional concrete cast. I primarily pursued two variations of patterns: A triangular version with 60-degree intersections and an orthogonal version with 90-degree intersections. I chose to pursue three variables in the pattern design that could be equally applied to both versions of the pattern: Rotation, line scale (local) and pattern scale (global).

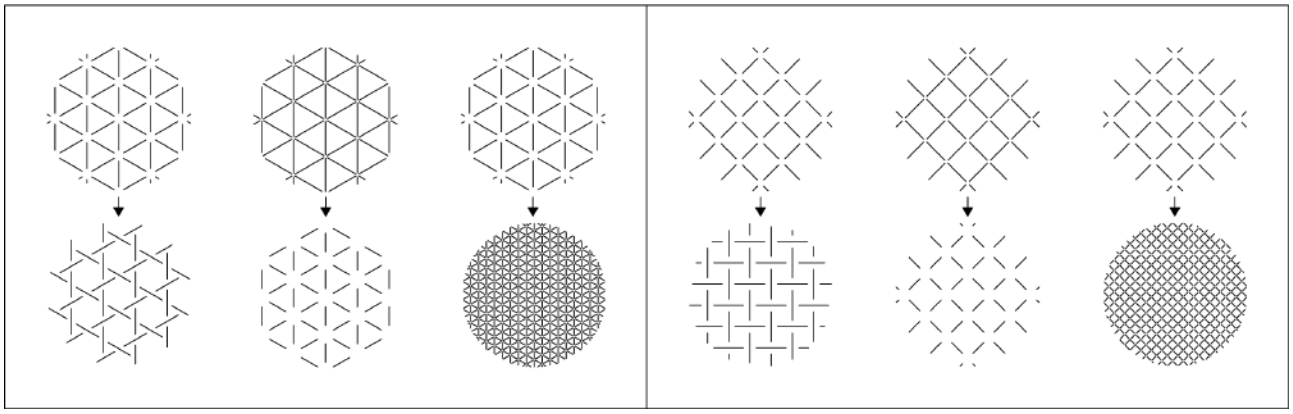


Fig. 6. Rotation, local scale, global scale for both versions

Each sample is cast in identical rigid formwork: A square container measuring 30x30x2cm with four identical circular cut-outs in the bottom. The bottom surface is lined with a 1mm rubber membrane, perforated in a variety of pattern variations, allowing the membrane to deform through the cut-outs. Each cast investigates four variations of rotation in the pattern and thus displays how the rubber deforms when the pattern rotates. The scale of each line and the scale of the overall pattern is thus constant across the four rotations of each cast (Fig. 7 and 8).

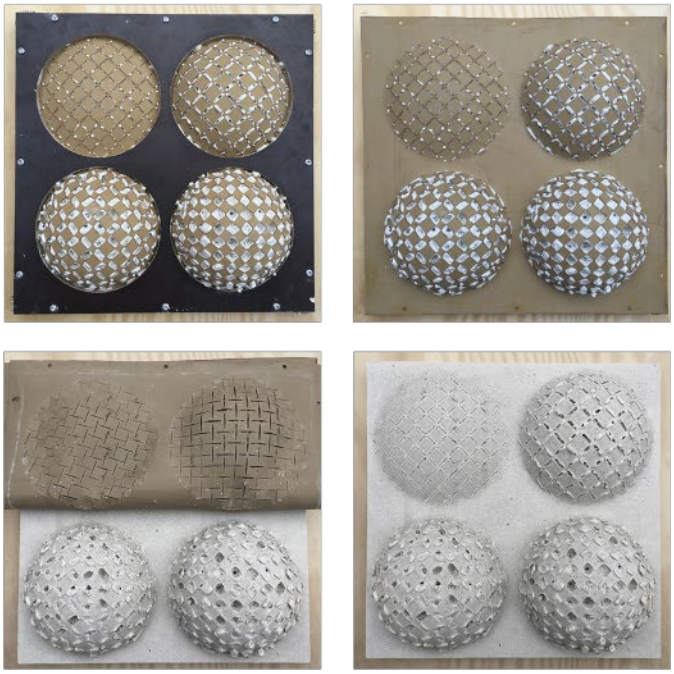


Fig. 7

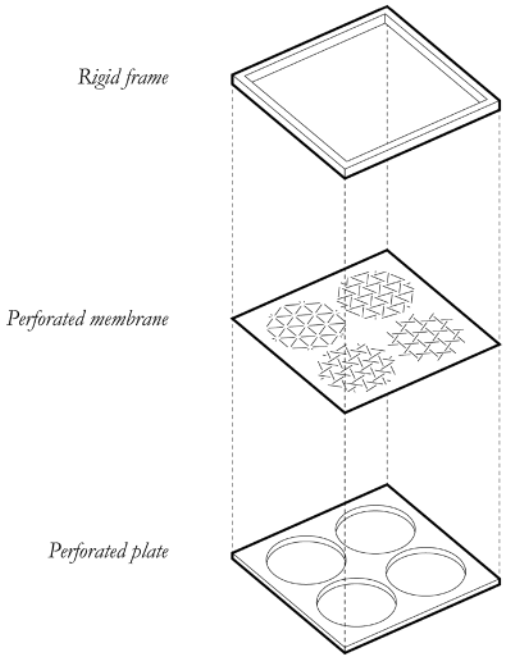


Fig. 8

For the rubber to not collapse and fall apart, I needed to scale down the (local) lines in the original pattern. I cast three versions with the individual lines scaled to 50%, 70% and 90% respectively, maintaining the four rotations within each cast. Lastly, I adjusted the scale of the overall pattern in three increments, doubling in size for each step: 5 mm, 10 mm and 20 mm. The combination of all three variables produced nine casts in both the 60-degree (fig. 9) and 90-degree (fig. 10) version of the pattern – 18 casts in all. Each collection of nine casts forms a square matrix with local line scale along the vertical axis (50 % at the top, 90% at the

bottom), global pattern scale along the horisontal axis (5 mm at the left and 20 mm at the right) and four iterations of pattern rotation within each cast.

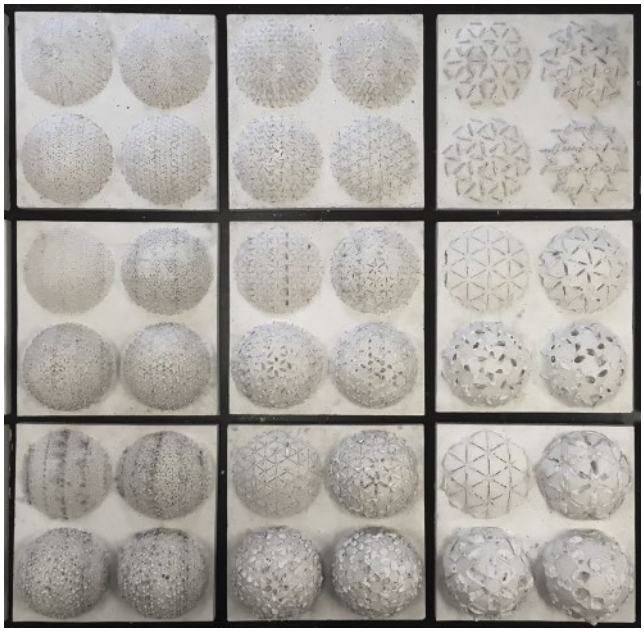


Fig. 9

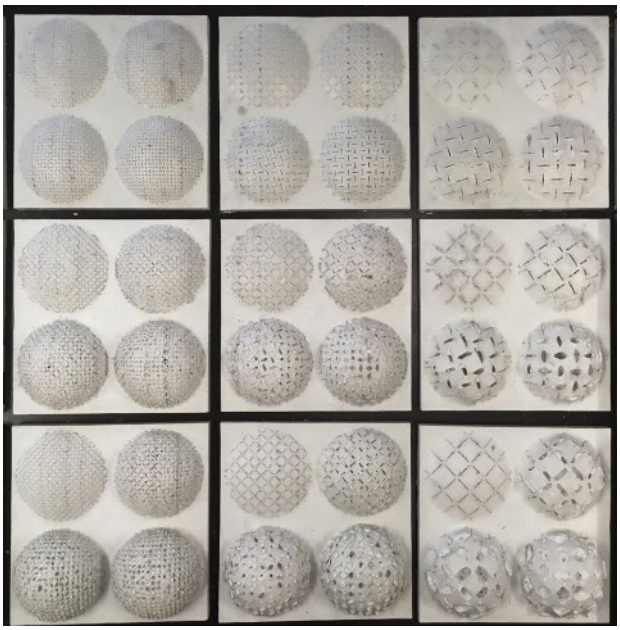


Fig. 10

4.2 Experiment evaluation

I expected the three variables to affect the concrete form differently; however, I had different knowledge – and thus expectations – about each variable. I knew the pattern rotation would change the rubber's ability to deform, but not how much. Since the rotation of the pattern affected how much each line overlap (Fig. 11), and thus how much the rubber can stretch from its initial state, I expected the pattern version with no overlap to deform the least. The experiments confirmed this assumption and deformed more as the pattern rotated, but surprisingly demonstrated almost no difference between the last two rotations (Fig. 12).

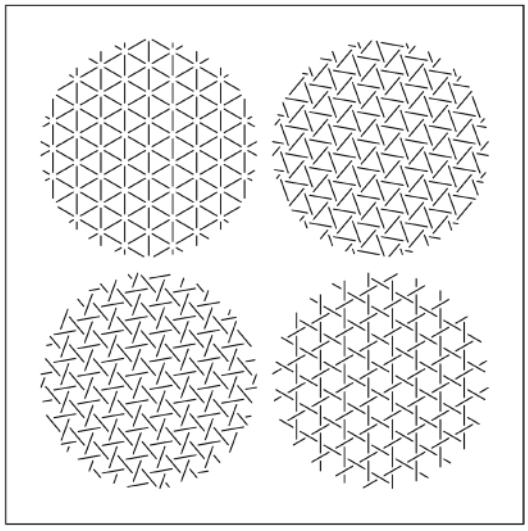


Fig. 11

Fig. 12

The local scaling of individual lines likewise affected the overlap between lines and I thus expected the rubber's stretching ability to change. The physical cast showed – to no surprise – that the shortest lines produced the smallest deformation and the longest ones the most substantial deformation (Fig. 13 and 14). Within this variable, I also explored the tolerance of the formwork: When only down-scaling the lines slightly, the distance between adjacent lines would be too short and break under the pressure of the concrete (Fig. 15).

Fig. 13

Fig 14

Fig. 15

Lastly, I expected the scale of the overall pattern to change the concrete's ability to permeate the membrane. However, how the concrete would negotiate its distribution with the perforations was unknown. In the physical casts, the scale of the pattern interacted with the scale of the concrete aggregate: The smallest pattern did not allow the sand particles to pass through and droplets of cement paste thus formed through the cracks (Fig. 16). However, as discussed above, in the 90% line scale casts, the rubber membrane partly broke, allowing the concrete to pass through and form larger cavities. These collapses moved beyond the breaking point and thus helped survey the borders of the design space. Both larger patterns allowed the concrete particles to pass altogether, forming cavities in the concrete surface (Fig. 17). Overall, the global scale of the pattern affected the surface quality of the concrete rather than the membrane's overall ability to stretch.

Fig. 16

Fig. 17

The combination of three variables both demonstrated different means to accomplish a particular effect – local line scale and pattern rotation both affects to what extent the membrane deforms – and how scaling

the pattern affected the appearance of the concrete surface across the other variables. Additionally, the casts link design permutations in the two-dimensional rubber membrane to effects in the three-dimensional deformation. The casts together form a catalogue of behaviour, allowing me to design both formwork deformation and surface quality within the possible pattern variables.

Fig. 18

Fig 19

While the experiment series investigates three clearly identifiable variables, a question remains about the variables not included. I did an initial experiment with formwork in geotextile but discarded the option because the rough texture of the fabric made it difficult to distinguish the surface emerging from the formwork from the surface emerging from concrete escaping through the membrane. Furthermore, in the case of geotextile, the perforation patterns cut across fabric fibres, annihilating its structural strength and thus negating the very reason to use it as formwork in the first place. I considered other thicknesses of either concrete, adding more pressure and weight, or rubber membrane, making it more or less amenable to the weight of the concrete. However, this would compromise the clear comparability of results within the three chosen variables. Several interesting side effects appeared in the interaction between formwork and concrete; in some instances, the pattern of concrete droplets through the rubber membrane was more interesting than the concrete form itself (Fig. 19). Similarly, the concrete formed patterns under the formwork as a result of the perforation (Fig. 18).

5 Further development

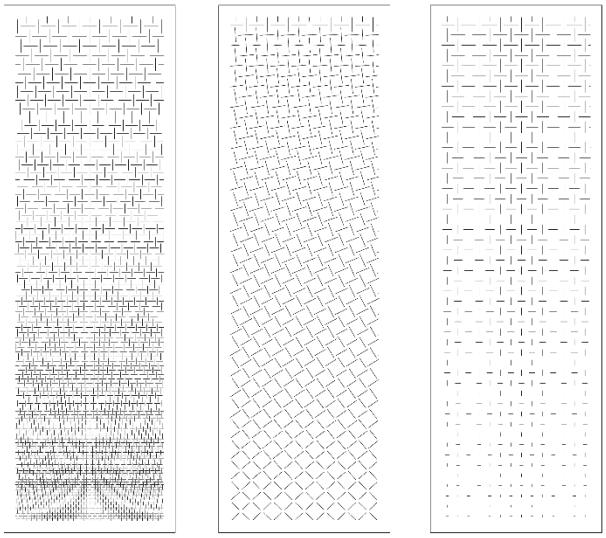


Fig. 20

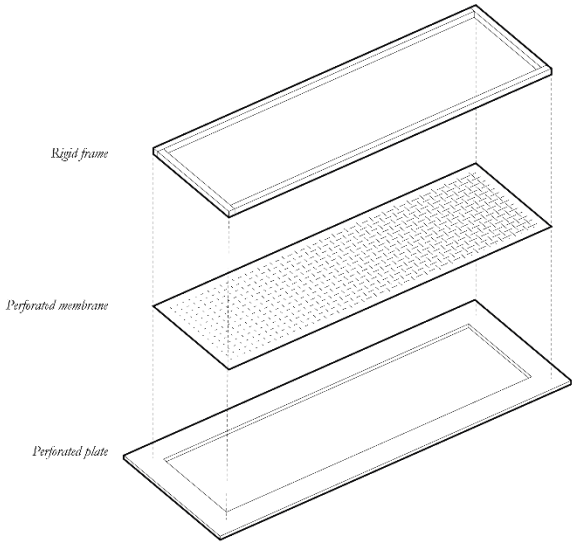


Fig. 21

The multitude of combinations within the experiment series identifies latent design potentials within the casting technique. However, as isolated deformations, each examining one variable, the casts do not explicitly demonstrate a potential of designing formwork behaviour in gradients across the cast. To bridge an imagination in larger scale, I thus expanded the membrane design to explore behaviour across each variable (fig. 20). The formwork consisted of the same three components, extended to measure 30x100x2 cm (Fig. 21)

Fig 22

Fig. 23

Fig. 24

Fig. 25

While larger in scale, the casts display the nuances within each variable: Globally scaling the pattern affected the membrane's ability to stretch significantly and unexpectedly beyond what I had experienced and perceived as possible (fig. 22 and 23). The smallest pattern resolution distributed the weight across the minute bridges between gaps, allowing an extreme deformation. All three casts demonstrated the feasibility of scaling up the experiment design and utilise local deformation as a design tool (fig. 24 and 25).

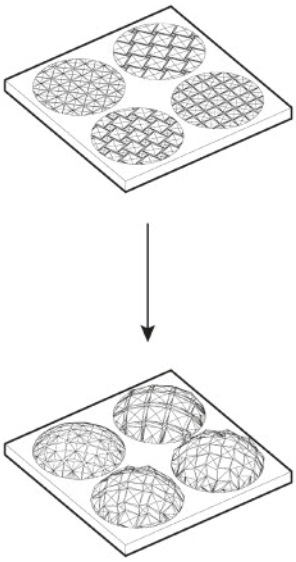


Fig. 26

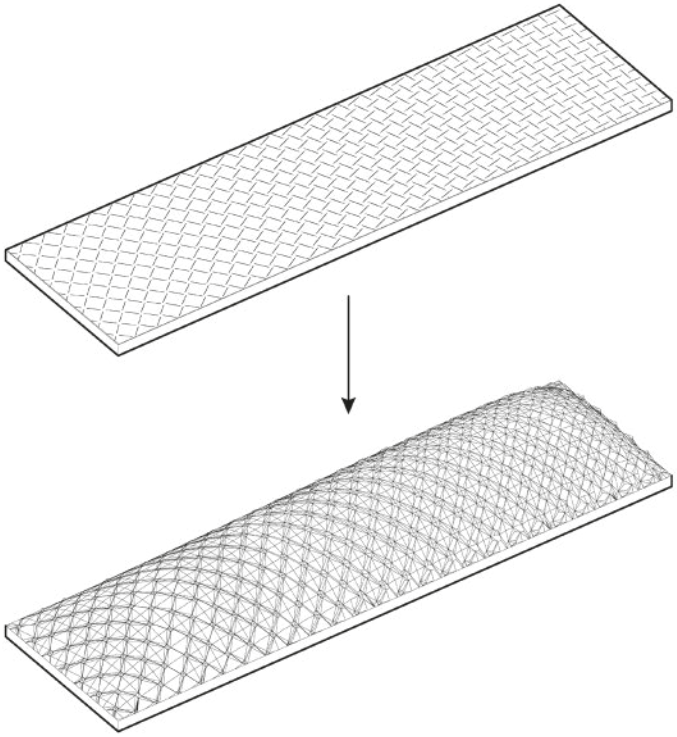


Fig. 27

3D scanning and simulation of membrane behaviour (fig. 26 and 27) will further the dialogue between perforation design and physical cast in larger scale experiments. While enabling a more deliberate design process, this will entail new challenges connected to the considerably larger mass of the casts.

6 Conclusion

The experiments in the series progressed from an ambition to study and understand certain exchanges between material and formwork, into a study of confirming accumulated insights. Completing the two matrices of small-scale casts thus doesn't reflect a process of iteratively building upon knowledge, but demonstrates a need to demonstrate the full range of variable combinations. Almost no new knowledge accumulated while finishing the second half of the casts. However, the experiment series did manifest a shift in my ability of apprehension during the individual casts; the physical experiences implicitly informed the design decisions with a higher degree of prediction. This observation supports the multitude of inputs in a holistic process, where design decisions manifest through material processes, informing further generations of experiments. The exchange with digital modelling and simulation feedback will act as a further input in this process, enabling me as a designer to continually pursue emerging possibilities with more knowledge. The question of scale undoubtedly takes precedence in experimenting with concrete and deformation, as the mass increases exponentially more than the linear scale of the cast. Insights gained from a particular set of variables thus might become obsolete while others emerge and dominate as the scale increases. Even at the mesoscale of the three rectangular casts, the behaviour and form transcended my knowledge and expectations – a set of expectations that are as much at stake as the outcome is at risk.

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8 Figures

Fig. 1: Illustration from *Bespoke Fragments*, PhD dissertation by Anders Aagard, 2017.

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Fig. 2: Work from the project XURF by Haresh Lalvani

http://lalvanistudio.com/architecture/xurf-purf/

Figs. 3-27: Author's illustrations

DIGITAL ARCHIVES
A SHIFT TOWARDS THE METEOROLOGICAL

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KAKD
Submission for Ca^{2}re 2018

Abstract:
Digital Archives: A Shift Towards the Meteorological

#digitalarchives #cloud

Digital archives are structured around data centres and the Cloud. I navigate these two research objects as both real and imaginary spaces. The cloud is an important realm in the spatial imagination of daily digital archiving practises. Data centres exist for most users only as abstract representations of stylized, clinical rows of blinking lights arranged in potentially endlessly repeated server rack units. To most, data centres remain as physically inaccessible as the cloud itself.

The materiality, spatiality and temporality of today's digital archives are situated at the threshold between the physical, the imaginary, the object and the metaphor. The nature of digital archives can be approached via two overarching themes, the geological and the meteorological. For the data centres, I investigate the geological materiality of digital technologies and notions such as redundancy and resilience. Here, the materiality, spatiality and temporality are more geological featuring e.g. stratification and layering. To describe the cloud, I draw on historical precedents such as the Renaissance religious theatre cloud machinery, on the meteorological cloud and the archival capacities of its aerosols, which e.g. carry biological and geographical information, and traces of nuclear or volcanic events. A more meteorological temporality of phasing, a spatiality of dispersal and patterning, and a materiality of scattered particles/data characterize the cloud.

Paper:
Digital Archives: A Shift Towards the Meteorological

The architecture of digital archives is underexplored because it is situated at the threshold of the imaginary and the inaccessible. The inaccessibility of data centres and the intangibility of the cloud result in the underuse of these evocative spaces as architectural references and lead to their capitalist exploit as sovereign territory. A detailed description of the spatiality, materiality and temporality of the cloud and data centres remedies their abuse of elusiveness and illustrates their architectural qualities. To begin, I invite the reader to delve into the dominant aesthetic description of data centres.

Imagine walking along a 2.8 metres wide corridor. The floor is covered in large, light grey, glossy tiles that are separated by prominent dark grey joints. Above you, there is a generic suspended ceiling, divided into panels that are about two-thirds smaller than the floor tiles. At roughly one metre intervals there is a rectangular, one panel wide light band stretching from left to right above the central part of the corridor, its flat brightness illuminates the scenery.

Uninterrupted rows of identical server racks line the corridor walls on both sides. They are made of near-black, dark grey frames with reflective Perspex doors. There are no visible handles to open the cabinets. At the very bottom, each rack features a centrally placed, flickering, pale green light source, suggesting activity. The cabinets contain 14 neatly stacked server units that slot perfectly into the width of the rack system. If each of these is one U in height, they are topped by a two U ventilation unit. The racks are ca. two metres tall and do not reach the ceiling, leaving a substantial gap. Above the racks, in line with the light panels, there are rectangular ventilation grids, covered by vaguely labyrinthine grates.

As you keep walking, there is no change in your spatial experience; the light remains even, every step feels like the previous step. The corridor is curving towards your right. As you can never quite see around the bend, you apprehend that the corridor may in fact describe a circle. There is no outside—no windows, no doors—just the slick, potentially endless repetition of racks, as far as you can see, before and behind you. Suddenly a kind of blur seems to materialize in the distance, where the corridor disappears into the curvature. As you approach, you recognize the blur as a small, picture-perfect cloud, hovering at about hip-height.

The speculation ends here, before physical contact can be made between the hypothetical data centre visitor and the non-meteorological cloud symbol. Save for the cloud, the imagined experience is a detailed description of a Shutterstock stock-video rendering loop titled “Seamlessly looping animation of rack servers in data center”. The copyright belongs to Saginbay, the image format is 16:9 and the clip lengths is 0:08. The HD version costs 79 USD, the cheapest (Web) version costs 39 USD. Such video loops are typical depictions of data centres—the outsourced and mostly inaccessible sites of digital archives.

I have enhanced the looping scenario with a cloud, because it is characteristic of visualizations that are designed to allude to not merely the data centres but also the digital cloud (google-image search “data centre and digital cloud”). The meteorological cloud becomes a strange, entirely abstract anecdote amidst deadpan renderings of data centre corridors.

The existing imagery of the architecture of digital archives is limited and insufficient: Abstract, generic and often computer-generated images of rows of server racks, with the intermittent rendered or photoshopped meteorological cloud suspended between the racks, or against a graded-blue sky that fades into the data centre corridor floor. It reveals little about archiving systems and archived data, other than its intense abstraction. My thesis counteracts this foggy symbolism of glossy surfaces and repetitive loops with an in-depth analysis of the spatial, material and temporal implications of the cloud metaphor.

While an exploration of the planetary imaginary and its influence on archives is beyond the scope of this paper, I explore the spatiality, materiality and temporality of digital archives through two modes of the planetary imaginary that I identify as characteristic: the geological and the meteorological. Research on media materiality, media geology and media archaeology has shown that the physical components of digital archives—the servers and their hard drive disks, the cables, containers and infrastructure—all draw on a geological materiality. The cloud on the other hand suggests meteorology as a kind of methodological and spatio-temporal point of reference for digital archiving practices.

In this paper, I will briefly outline these modes and their consequences on digital archives. The geological and the data centres lay open the concept of animated archives. The meteorological mode as engendered by the cloud, metaphorical and meteorological, open up the field of the nonconscious. I will conclude on my thesis of a great outdoors engendered by an updated variation of Romanticism in the Anthropocene.

The Geological Mode

Geology is a system—a logic or method—that engenders a specific kind of spatiality, temporality and materiality. New media theorist Jussi Parikka (*1976) describes geology as "the science about the ground beneath our feet, its history and constitution, the systematic study of the various levers, layers, strata, and interconnections that define the earth."[1] Parikka values geology as *a way of thinking* about the assemblies between life forms and technological systems:

> It connects to the wider geophysical life worlds that support the organic life as much as the technological worlds of transmission, calculation, and storage. Geology becomes a way to investigate materiality of the technological media world. It becomes a conceptual trajectory, a creative intervention to the cultural history of the contemporary. [2]

Like media historian John Durham Peters (1958*) and thinkers associated with the Canadian media theory tradition, such as Harold Innis and Marshall McLuhan, Parikka is interested in media not merely as apparatuses but as systems that "refer back to cosmology and geology" and the "idea of the earth, light, air, and time as media."[3] He postulates the concept of a "geology of media: a different sort of temporal and spatial materialism of media culture than the one that focuses solely on machines or even networks of technologies as nonhuman agencies."[4] Parikka thus draws attention to the geological materiality and, what I would call, the geological mode of operation that characterises media culture.

The geological mode is also temporal. Media theory has established temporal ties between geology and media theory by emphasizing temporalities discovered by media archaeology and its shared notion of deep time.[5] Deep time is a concept first established by the founding father of geology, James Hutton (1726-1797). Geologic or deep time is tied to uniformitarianism—the understanding that geology is based on gradual processes such as erosion and sedimentation that continuously change the planet. Hutton's theories were popularized by his successor, Scottish geologist Charles Lyell. In his seminal book *The Principles of Geology*, Lyell describes the planet as its own archive-archivist—always changing and keeping track of its own changes: the planet's geology as an archive of change. It was the role of the geologist to make sense of the somewhat messy archive.

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[1] Jussi Parikka, *A Geology of Media* (Minneapolis: University of Minnesota Press, 2015), locations 192-199, Kindle for Mac.
[2] Ibid., locations 192-199.
[3] Ibid., locations 181-185.
[4] Ibid., location 181.
[5] Ibid., locations 249-255.

The notion of the planet as archive historicizes theorist Benjamin Bratton's (*1968) unambiguously geological understanding of computing as a planetary scale *Stack* composed of digital and infrastructural layers: A "cybernetic landscape"[6] that quivers like the geological ground "in barely accountable rhythms."[7] Stacking evokes a geological spatiality that results from stratification, layering and piling. The foundational layer is *Earth* as Bratton "argues for a foregrounding of the geological substrate of computational hardware and of the geopolitics of mineral and resource flows of extraction, consumption, and discarding."[8]

Media technologies consume a large amount of *the ground*—rare earths, minerals and metals, such as cobalt, gallium, indium, tantalum, antimony, platinum, palladium, niobium, neodymium and germanium. The devices on which digital content in data centres is archived can be understood as materially composed of rearranged geological (archive) layers. Information is saved on hard drive disks and deciphered by a sensor head that scans the surface of the discs layered with magnetic fields of zeros and ones. These platters are composed of a number of extremely thin layers to generate the necessary smoothness and magnetic storage capability. The first layer contains platinum group metals (pgm) and functions as an optimized "soft magnetic underlayer" for the perpendicular field on which the data is imprinted. Two Co-Ni-Fe (cobalt-nickel-iron) layers separated by a 4-atom thick layer of ruthenium constitute this stratum.[9] The next layer is for the magnetic storage. It is made of sub layers of Co-Cr-Pt (cobalt, chromium, platinum) alloys. The materials used define the abilities of these incredibly thin layers:

> The cobalt provides the necessary orientation of the crystals; the chromium improves the signal-to-noise ratio, while the platinum provides thermal stability. Ruthenium is also to be found here …. Its role is to help orientate the magnetic grains, as well as reducing interference between layers.[10]

Each material thus plays a precisely defined role in the archival strata of digitally deciphered, re-organized geological disks. The ground as the source of digital materiality and archival temporalities resonates with the multidisciplinary scientific dissection and archival of "the Big Data of ice, rocks, soils, and sediments."[11] The extended field of geology pierces the ground, extracts core samples, preserves these in their "muddy, icy, soggy"[12] states in order to analyse, classify and archive them in ways that, in media scholar Shannon Mattern's words, "acknowledge the Earth as a vast geo-informatic construct."[13] Unlike the Big Data gathered in the cloud, this geological data is "resolutely material"[14] and demands preservation of its atmospheric and climatic conditions in order not to wither.

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[6] Benjamin H. Bratton, *The Stack: On Software and Sovereignty (Software Studies)* (Cambridge, MA: The MIT Press, 2015) locations 669-1671, Kindle for Mac.
[7] Ibid., locations 1669-1671.
[8] Ibid., locations 2051-2053.
[9] http://www.platinum.matthey.com/about-pgm/applications/properties-of-pgm
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[12] Ibid.
[13] Ibid.
[14] Ibid.

Animated Archives

This necessary atmospheric conditioning can be observed for example in the Lamont-Doherty Earth Observatory of Columbia University, one of the three largest core repositories in the United States. Here, sediment cores from every major ocean and sea are preserved in two large rooms. One of these contains cores taken after 1985 and is consistently refrigerated at 4.5°C to preserve the moisture contained in the sediment samples. The facility houses 18700 cores of 8 and 5 foot lengths, adding up to approximately 72,000 meters of core. The moist samples are contained in closed plastic tubes, the dry samples are in open rectangular metal trays. The samples are divided into an untouched archive core and the *dissectible* analysis core. If a scientist requests a particular section of the analysis core half, these gaps are filled with foam placeholders.

These archived cores in their storehouse of the planet's extracted geo-informatic data convey a distinct sense of *being animated*. Only the substances that *used to be alive* are singled out for analysis. In a first step of analysis, scientists thus extract fossils of plankton species from the cores. These fossils allow the dating of contained oxygen isotopes ("light" oxygen-16 and "heavy" oxygen-18). The ratio of occurrence of these two isotopes reveals information on ice caps, temperature, CO_2 values and by extension ocean currents, prevailing winds and water levels at the time of living of the dissected fossils. The study of sediment cores is thus an analysis of the compressed remnants of life as these formerly animated articles activate the archival potential of the sediment cores.

On a second level of animation, the cores are being sustained, like living organisms, under certain environmental conditions with the help of a continuous, hypothetically never-ending electricity supply. The trend is towards ever-perfected sustenance by imitating the native conditions of the habitat of the archived cores. Similarly, servers in data centres—also geological carriers of archival information—are sustained in carefully calibrated environmental conditions. Temperature is kept within a range of 21-24 °C, the dew point within −9 to 15 °C and the relative humidity close to 60%. The language describing different archival facilities has adapted: Cold storage is the term used for less frequently accessed data. *Cold* does not actually refer to the temperature in data centres but to slower response times. Thus, to retrieve colder data takes longer, as if it had to be warmed up first. It is also the kind of data, such as back-up or legal data, that has to last longer, like frozen organic goods. Temperature thus denotes levels of animation or activity. Not only does the environment need to be maintained, the actual servers also need to be continuously animated by a stream of electricity. In order for the information to be retrievable, the disks contained in server hard drives have to *animated*: they need to be spinning, so that the static sensor can read the entire disk's embedded information.

Considering the compressed geological materiality of the server disks, they can be read as sediment cores 'in reverse'. Rather than extracting a compressed cylinder, which is then separated into atoms-thin temporal disc-slivers containing flattened information of formerly animated entities, the hard drive disk is the result of a process of maximized compression of information onto magnetic, geological material. In my thesis, I further explore the spatial nature of digital archiving through the geological mode of flattening, stratification, compression and petrified flows—processes that become activated in the animated archive.

Meteorological Mode

The digital cloud—part radio waves, part meteorological metaphor, part spatial imagination—has come to conceptually umbrella and safeguard all digitalized and externalized data and its analysis. It stands in for the data centres that physically contain the archived data and blurs their physical materiality. The cloud suggests meteorology as a kind of methodological and spatio-temporal point of reference for digital archiving practices and data analysis and is, as I will show, also an animated archive in the meteorological mode. I will show that the meteorological engenders a way of organizing information that has been imitated by the digital cloud and explains the use of *cloud* as metaphor for data analytics and storage services tied to static, generic and firmly situated data centres.

The term "digital cloud" is a metaphor because it really refers to digital storage on servers in data centres that are connected to sites of document production via Wi-Fi and fibre optic cables. The cloud, meteorological and digital, is an archival entity, a *space* of inaccessible archives and elusive materialities—imagined as much as material and infrastructural. It is a body without surface[15] that visualizes information, unbound by geographical coordinates.In order to describe the spatial and temporal potential of this metaphor, as encapsulated in the meteorological mode, I explore a variation of the cloud that arguably originates the metaphor: the meteorological cloud.

67% of the planet are always covered by clouds. Planet Earth is a cloudy haze more than a blue marble. Despite their continuous presence, clouds remain fundamentally elusive: They are unmappable and difficult, if not impossible to model or predict accurately, because clouds visualize immense amounts of data—not all of which is fully understood by scientists. This data is in a constant flux of updates as it interacts with other elements. The meteorological cloud can be understood materially as an archive. It consists of water and transports the particles onto which water condensates, the aerosols, also known as "seeds" or cloud condensation nuclei. Aerosols transmit a variety of physical information, for example of deserts and flora, of nuclear events, explosions, volcanic activity, and CO_2 pollutants.

Aerosols—fine solids and droplets—are found in the tropo- and stratosphere. They vary in size from "a few nanometres—less than the width of the smallest viruses—to … about the diameter of human hair."[16] 90% of them occur naturally, 10 % are anthropogenic. Aerosol particles stay in the air for four to seven days, and they may travel at speeds of five metres per second. Depending on their source, aerosol types conglomerate in characteristic areas. For example, oceans are veiled by a thin mist of salt and sulfates aerosols produced by whitecaps and microalgae. Enormous dust plumes form above deserts.

Aerosols differ in their surface topography and chemical composition, which affects their ability to seed clouds, how much light they reflect and how much energy they store. The information clouds carry constitute their materiality and influences their spatial formation. One cloud might assemble volcanic ash,

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[15] Leonardo da Vinci, C.A., 132rb; *The Notebooks of Leonardo da Vinci*, ed. Edward MacCurdy (London, 1938), vol. 2, pp. 363-64. See Hubert Damisch, *A Theory of /Cloud/: Toward a History of* Painting, trans. J. Lloyd (Stanford: Stanford University Press, 2002), 281.

[16] https://earthobservatory.nasa.gov/Features/Aerosols/page1.php

pollen, sea salt and soot. The soot might then cover the surface of sea salt particles. This mix in turn will determine how much heat the cloud retains or reflects, and when it precipitates as rain.

The morphology of clouds is in constant flux, just as their chemical and physical composition. They are thus difficult to classify. Prior to 1802, meteorological clouds were similarly enigmatic as the mysterious space that the digital cloud of invisible non-ionizing microwaves occupies in the imagination of its users. Only when pharmacist and amateur meteorologist Luke Howard (1772-1864) presented a nomenclature for clouds at a popular science theatre in London in 1802, clouds became considerably more tangible. Howard's nomenclature came after a century characterised by great advances in taxonomy, spear-headed by Swedish botanist Carl Linnaeus, who established a binomial classification system for organic life with the publication of his *System Naturae* in 1735. However, the revolutionary aspect about Howard's system was that it classified occurrences that are not entities in themselves, but that are the "visible signs of vast atmospheric processes."[17] His three basic categories of clouds—cirrus, stratus, and nimbus—reflected atmospheric processes instead of their resulting shapes and could be combined to describe further cloud variations. One could now distinguish a plump nimbus cloud consisting of condensed water from a delicate cirrus cloud, with its thin, feather-like strands of ice crystal formations.

Since Howard's time, when clouds could only be studies from below, much insight has been gained by seeing clouds from above, enabled by long-term observations[18] from NASA's Terra and Aqua satellites launched in 1999 in 2002 respectively. From above it becomes clear just how responsive clouds are: cloud patterns reflect the topography and temperature of the planet's surface, and its reflectivity, ships and airplanes, winds and atmospheric pressure.

A striking example are wave clouds. Seen from above, these form large V-shaped fields of alternating clear and clouded strips, like air ripple moiré patterns. The bands visualize the collision of air masses of different temperatures and moisture content. They occur when tall icebergs or islands push circulating air masses upwards, where they meet the higher travelling air masses. A by comparison miniscule iceberg impacts a vast field of air surrounding it. Looking at cloud patterns thus points to two archival aspects of the cloud: On the one hand, there is the information embodied in the particles, their origin, travels and interactions. On the other hand, there is the continuously changing context of the cloud. A cloud visualizes its surroundings, and by extension, the world.

This notion resonates with the origins of computing as closely linked to the planetary imaginary as an archivist practise. Charles Babbage (1791–1871), Lucasian Professor of Mathematics at Cambridge University from 1828 to 1839, was an important figure in setting this trend. Rather than seeing the ground as archive, as did his friend Charles Lyell, Babbage declared, "the air itself is one vast library"[19] of all the words that have been spoken, and all the winds and currents that have acted upon it. His view of the world as archive was informed by a computational logic that also led to his computing inventions – the Difference Engines I and II and the conceptually more complex Analytical Engine.

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[17] Richard Hamblyn, *The Invention of Clouds: How an Amateur Meteorologist Forged the Language of the Skies* (New York: Farrar, Straus, and Giroux, 2001), location 1989, Kindle for Mac.
[18] (http://ieeexplore.ieee.org/document/6422379/)
[19] Ibid.

Babbage believed with "Laplacean determinism"[20] that given enough computational power, "An intelligence who at some given moment knew all the forces that animate nature, and the respective situation of the beings that compose it"[21] would be able to compute the components' past and future trajectories. According to Babbage, when we speak, we set airwaves into irreversible motion, affecting every atom of the atmosphere and changing their trajectories forever. He describes the irretrievable effect of speech on the atmosphere's molecules as follows:

> The pulsations of the air, once set in motion by the human voice, cease not to exist with the sounds to which they gave rise…. The motions they have impressed on the particles of one portion of our atmosphere, are communicated to constantly increasing numbers…. The waves of air thus raised, perambulate the earth and ocean's surface, and in less than twenty hours every atom of its atmosphere takes up the altered movement ….[22]

With enough computational power, knowledge of the air's behaviour and causes acting on it, the atmosphere's past and future trajectories can be deduced.[23] The air in Babbage's view is thus an archive and a predictive tool, a visualisation of the forces that act on it, just as the clouds are responsive visualizations of extensive information and processes: the phase-behaviour of water, wind movement, atmospheric conditions, chemical and physical aerosol behaviour and interactions, the history of these particles—their creation and travels—and nearby physical bodies—the air movement these cause, their temperature and trajectories.

This apparently disconnected interaction is the spatio-temporal structure of today's digital archives, which are governed by the meteorological mode: a spatiality of dispersal, a temporality of phasing and materiality of patterned particles. The meteorological mode has already precipitated in the architectural discourse, for example in Keller Easterling's *Extrastatecraft* (2014), which traces socio-economic power structures and their space-shaping potential in infrastructure space. Architecture is moving away from the Cartesian object locatable in an absolute grid system towards the logic of infrastructure, governed by disposition,[24] Simondonian flows and the channelling of agencies, activities, information and material that—much like much like its users—navigate space by correlation. The concern with space that has dominated modern architectural discourse gives way to a cloudy gathering of what traverses it, be it bodies without surfaces, withdrawing objects or channelled resources.

A politics/perception/geometry based on the spatiality of the cloud could, unlike the postulated danger of the territory of sovereignty associated with the cloud of Big Data, result in a more fluid, less exclusive concept: oriented along da Vinci's understanding of bodies without surface that "readily melt into and mingle with other thin bodies." By consequence, their extremities "are mingled with the bodies near to

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[20] Geoffrey C. Bowker, *Memory Practices in the Sciences (Inside Technology),* (Cambridge, MA: The MIT Press, 2005), location *1024-1033*, Kindle for Mac.
[21] Ibid., location *1024-1033*.
[22] Charles Babbage, *The Ninth Bridgewater Treatise*, 2nd edn. (London: John Murray, 1838), p. 108-109.
[23] Ibid., p. 111.
[24] Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (New York: Verso Books, 2014).

them, whence by this intermingling their boundaries become confused and imperceptible."[25] Clouds thus mark the threshold to an increasingly inhabited yet under-described spatiality of inclusive variability, fluid accuracy and unbound locatabilty.

The Great Outdoors

The cloud can be seen to establish what French philosopher Quentin Meillassoux calls "le grand dehors": an utterly removed, barely imaginable, yet ever-present great outdoors.[26] Meillassoux's term emerges from his discussion of pre-critical thinkers, who still had access to "the absolute outside…that outside which was not relative to us…that outside which thought could explore with the legitimate feeling of being on foreign territory—of being entirely elsewhere."[27] The digital cloud is "entirely elsewhere"; it is an agglomeration of information that was once interior to its users, but it withdraws from them, becoming a convergence of three lines of inaccessibility: spatial disorientation, the impossibility of touch, and inconceivable accuracy.

The Anthropocene romanticizes the notion of a *pure* nature, uncorrupted by human presence. Human activities are now a dominant influence for the entire planet, including even its climate, which raises the concern that all unchartered, pristine, or "healthy" territory has been corrupted. In light of these anxieties, the cloud recreates a precious, unknowable, and inaccessible space that has been lost to us since an expulsion from paradise, or the separation of a world of ideas from a world of things, or the dawn of the Anthropocene. The digital cloud is "entirely elsewhere": despite being generated by human content, it is inaccessible to human bodies and comprehension. The spatial intangibility of the cloud and the incomprehensible accuracy of its data points cause the cloud to withdraw, pulling it further and further away from us as it transforms into our great outdoors.

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[25] Leonardo da Vinci, C.A., 132rb; *The Notebooks of Leonardo da Vinci*, ed. Edward MacCurdy (London, 1938), vol. 2, pp. 363-64. See Hubert Damisch, *A Theory of /Cloud/: Toward a History of* Painting, trans. J. Lloyd (Stanford: Stanford University Press, 2002), 281.

[26] Timothy Morton describes this as a clumsy translation of the French "le grand dehors" in *Hyperobjects: Philosophy and Ecology after the End of the World* (Minneapolis: University of Minnesota Press, 2013), 64.

[27] To Quentin Meillassoux, George Berkley was one of the first "critical" thinkers because he divided perceivable qualities into primary and secondary: "Those properties of the world which are a function of our relation to it, and those properties of the world as it is 'in itself,' subsisting indifferently of our relation to it." To Meillassoux, the problem is defined by the fact that "thought cannot get outside itself in order to compare the world as it is 'in itself' to the world as it is 'for us,' and thereby distinguish what is a function of our relation to the world from what belongs to the world alone." Quentin Meillassoux, *After Finitude: An Essay on the Necessity of Contingency,* trans. Ray Bassier (London: Bloomsbury, 2008), location 97, Kindle for Mac.

TECTONIC EXPRESSIONS IN BRICK ARCHITECTURE

UDO GARRITZMANN

Tectonic Expressions in Brick Architecture

Key-words:
Tectonics, architectural design theory, brick architecture

Introduction:
This paper is part of a broader research effort which contributes to the understanding of the term *tectonics* in the field of architectural design theory leading to a general theory of tectonics, which broadens and differentiates the term's comprehension. Preliminarily, I have named it *Framework for Tectonic Thinking (FTT)*[1]. It provides a mapping of potential tectonic expressions and a vocabulary for their distinction. The FTT is considered to be a conceptual tool of the architect that can be employed in the analysis of buildings, in their conception, and as a trigger for imaginations of tectonic possibilities. In this paper, I will apply the FTT to the analysis of historical and contemporary brick architecture.

Before I will start to reflect on tectonic expressions in brick architecture I will shortly summarize my ideas about the Framework for Tectonic Thinking. To propose such a conceptual framework is motivated by my wonder about the use of the word tectonics within the metier of architecture which appeared to me often as unprecise and sometimes contradictory. In old Greek the term was originally associated with carpentry, then with working on hard building materials (besides metal) before it was associated with making in all building crafts.

Today tectonics is associated with a variety of things: building construction as a craft; with material and making; industrial ways of building; digital fabrication; particular ways of detailing (the tell-tale-detail); the motive of the frame and the infill (coming from carpentry); the expression of the loadbearing structure; a poetics of construction; a value judgement distinguishing good architecture from bad architecture, or architecture from mere building; just as synonym for architectural; etc.

In most cases the term tectonics indicates a way of building that exceeds mere functional construction; it considers construction aesthetically, and vice versa aesthetics constructionally. Therefore, I define tectonics as an architectural expression in which the dual notions *construction* and *appearance*, or *technique* and *aesthetics*, or *firmitas* and *venustas* (to use two terms of the Vitruvian triad) are considered as complementary.

[1] I had the chance to present my FTT at several occasions: Tectonic Perception symposium, 2017, Utzon Centre Aalborg, https://vimeo.com/219141776; CA2RE conference 2017, KU Leuven, Ghent; EAHN conference *The Tools of the Architect*, 2017, TU Delft.

Referring back to Karl Bötticher's *Die Tektonik der Hellenen* (Bötticher 1874) a major strand of the discourse, most importantly represented by Kenneth Frampton (Frampton and Cava 1995), has identified the concept of tectonics with the artistic articulation of the loadbearing structure. Preferably this concerns the actual loadbearing structure, but it may also be articulated through representation. I regard this loadbearing position as an important and at the same time a very productive position on tectonics. However, I find it restricting to limit the discourse on tectonics to this position alone, especially if I think of Gottfried Semper's theory on tectonics. (Semper et al. 2004) It is also employed by the loadbearing fraction to substantiate their position, but it actually suggests a more comprehensive and diverse account of the subject.

My other issue with the loadbearing fraction is that it comingles descriptive uses of the term tectonics with assertions that imply a value judgement, and as a result it turns its own position into a normative criterion.

With the *Framework for Tectonic Thinking* I should like to propose a descriptive and analytic approach to tectonics which broadens and differentiates the understanding of term. I regard it as a non-essentialist and non-dualistic classificatory system. It combines three constructional categories, each with two oppositional poles:

1. Loadbearing construction: loadbearing versus non-loadbearing
2. Conjoining construction: solid versus filigree
3. Constructional appearance: tectonic versus atectonic

The constructional categories should be seen as vectors that exert their conceptual influence on a space of potential constructional appearances where *tectonic* forms express aspects of loadbearing construction and conjoining construction, while *atectonic* forms of appearance suppress or dissimulate any reference to these. The FTT distinguishes eight conceptually pure constructional forms of appearance:

Four of them coincide with the primordial technical arts:

- textile
- ceramic
- stereotomy (stone construction)
- carpentry

The other four constitute their opposites:

- atectonic textile (e.g. air wall)
- atectonic ceramic (e.g. thermal radiation)
- atectonic stereotomy (e.g. floating substructure, dematerialized floor)
- atectonic carpentry (e.g. floating roof, dematerialized supports)

These conceptually pure constructional appearances should not be understood as ideals or essences that should be approximated as close as possible. For any of the pure positions a multitude of appearances is conceivable. Between the pure tectonic appearances there is a field of hybrid tectonic appearances in which characteristics of pure tectonic appearances are combined. Hybrid appearances are considered equally valid as pure appearances.

The categories and their polar distinctions are considered to be non-dualistic, that is they do not imply a value judgement. The expression of loadbearing construction is neither better nor worse than the expression of non-loadbearing construction. The same goes for each of the poles of conjoining construction and of constructional expression.

Due to the space-time limitations of this conference presentation I have to refer the discussion of the atectonic side of the FTT to a different paper. In what follows I will only concentrate on the tectonic side where the four primordial technical arts provide a reservoir of "typical" motives or formal principles. Semper addresses this at great length in *Der Stil.* I will recapitulate the important formal principles that he defines and relate them to possible expressions in brick masonry. But before I will shortly reflect on the question:

To which of the four primordial technical art can brick masonry be related?

From material point of view brick's raw material lets one immediately associate it with ceramics, however, from a formal point of view the principles and motives of other technical arts are more important. As Semper asserts, '[…] there are objects that certainly belong to ceramics from the point of view of materials, inasmuch as they were formed from a soft mass that was then hardened and fixed. But they should be seen as relating to ceramics only secondarily, because formally they are in a different sphere. Objects of this kind include bricks, roof tiles, terra-cotta, and glazed tiles–used both for dressing walls and tiling floors.' (Semper et al. 2004, 109–10)

But if not ceramics, to which other primordial technical art can brick be related? In this context it actually would be more precise to speak of *brick masonry* instead of just brick. Herewith two aspects come to the fore: firstly, brick – different from "proper" ceramic products – is only a semi-product which is assembled into brick masonry which is the actual product of our considerations; secondly, brick masonry is usually not only assembled from brick alone but also from mortar.

The rectangular and regular shape of its composing building parts, and their horizontal stacking into a regular assemblage are formal characteristics of *stereotomy* (or stone construction) that associate brick masonry with this technical art. The mortar joints, in contrast, create a mesh of jointing, and in their interplay with the bricks a surface pattern that associates brick masonry with the *textile arts*.

For Gottfried Semper the formal principles of the primordial technical arts were not necessarily contradictory or mutually excluding. However, it is perhaps due to this reference to the two so different technical arts that the discourses on the tectonics of brick masonry at times turn out to be rather oppositional. Ákos Moravánszky has characterized these two discourses as, 'one on the surface as a signifier and spatial delineation, the other on the mass as a product of a craft' (Moravánszky 2013, 90). This distinction suggests a number of opposing poles which can inspire the formal expression of brick masonry: solid versus filigree, loadbearing versus non-loadbearing, volumetric mass versus planimetric surface, heavy versus light, deep structure versus surface appearance, and so forth.

These oppositions are comprised in the German language in the distinction of two different words for the English word wall: *Mauer* (the loadbearing wall) and *Wand* (the wall as spatial delineation); the first referring to stone construction or *stereotomy*, the latter to the *textile* arts.

To nuance Moravánszky's characterization of the two polar discourses on the masonry I should like to suggest that the masonry wall that in its formal appearance is referring to textile should also be regarded as a product of a craft, and that the masonry wall that formally is referring to stereotomy can also be regarded as a signifier or symbol.

Meanwhile we can summarize already that the tectonic nature of brick masonry is ambiguous, because it can refer to two technical arts as distinct as *stereotomy* and *textile*. In the following paragraph I will discuss how brick masonry can emphasize in its tectonic expression a reference to any of the four primordial technical arts, also *ceramics* and *carpentry*.

Textile expressions in brick masonry

Semper considered textile to be the oldest technical art from which a host of formal principles originated; the string, the band, the cover, the seam (the principle of making a virtue out of necessity), the hem, the principle of dressing, the principle of masking. Important for us is that in Semper's understanding the wall as spatial enclosure emerged from the textile arts – the wall as *Wand*. This textile origin constitutes the essence of the wall. It suggests the *principle of dressing* which means that the textile reference of the wall should be maintained even if the material from which the wall is made changes. It is the surface appearance of wall, not its deep-structure, that matters. A wall made of stones should still express textile principles.

Another often referred to principle is the *principle of masking*. It means that technical mastery should be aimed for in order to make the beholder forget any material constraints or technical efforts; loadbearing, keeping a construction together, waterproofing, etc. should not be expressed.

> ‘Only complete technical perfection, only the judicious and proper treatment of the material according to its properties, and above all only the consideration of these properties in the act of shaping form can cause the material to be forgotten, can liberate the artistic creation from it […].’ (Semper et al. 2004, 439)

For brick walls the reference to textile is productive.

> ‘To start with, one could say that all bonding patterns resemble textile patterns in the first place. They develop a formal motive (the bonding pattern) from the technical necessity of joining the bricks, just as weaving patterns emerge within the technical constrains of warp and weft. The use of two contrasting colours of brick intensifies the resemblance of the bonding patterns to ones used in textile. The most decorative brick patterns, in which the function of the bonding is subordinate, evoke the strongest association with textile patterns.’ (Garritzmann 2016, 123)

Koen Mulder describes in his book *The Thrilling Surface* the pattern making in brick masonry as the result of the interplay between the primary horizontal stacking and the secondary vertical alignment (of headers, perpend joints and stretchers). As a third aspect he considers the edge condition of a brick wall which also influences the visual reading of the pattern. (Mulder 2016, 5) His brilliant book shows that with basic bricks there are already countless ways to develop brick patterns.

No need to say that all brick patterns have to conform to the formal logic of the brick, that is its modular measures, and the constructional restrictions and possibilities following from it. This is actually the case for all tectonic expressions in brick. Textile tectonics in brick architecture enjoy articulating patterns out of the technical necessity of conjoining that make this very necessity forgotten. From history to the present we can find diverse textile expressions in brick masonry. A few of my favourite examples are: the dovecote of the manor of Ango in Varengeville-sur-Mer (1532); the former opera house (today: high court) in Copenhagen by V.F. von Platen (1703); the Sprinkenhof in Hamburg by Hans and Oskar Gerson and Fritz Höger (1925-1943).

Ceramic expressions in brick masonry

To begin with this paragraph, I should like to suggest that Semper’s assertion that brick articulates formal principles of a ceramic only in secondary way should be slightly nuanced; at least in the case masonry that employs *moulded bricks.* It adopts through its moulding a formal principle that Semper actually considers to be ceramics most important contribution to the formal repertoire of architecture. It is the ‘formal articulation of parts and the contrast between these parts’ (Semper et al. 2004, 554). Mouldings in brick masonry are used just like in ancient Greek architecture to articulate transitions between parts such as a tripartite arrangement of a wall.

The German art historian and oriental archaeologist Friedrich Sarre had identified the moulded brick as a typical building element in the so-called North German Brick Gothic. 'The capacity of clay to easily adjust to the forming hand of the artist, with advanced exercise and experience lead to the creation of gothic profiles and foliage ornaments, and even figurative depictions. […] everywhere we encounter the glazed and in manifold coloured dazzling moulded brick which appear to be vitalizing to the massive and heavy masonry.' (Sarre 1890, 7)

Towards the end of 19th century the catalogue of many brick manufacturers in Germany and in the Netherlands contained a number of standard moulded bricks, which were used in Neo-Gothic architecture (e.g. Central Station and Rijksmusem in Amsterdam), as well as in other architectural styles.

Timber expressions in brick masonry

Semper defines carpentry as 'the art of assembling stiff, planklike elements into a rigid system' and considered it 'indisputably the most important art for the theory of monumental style, if only because the gable roof with its supports has been the traditional symbol of the *sanctuary*.' (Semper et al. 2004, 623) However, carpentry is the technical art which according to Moravánszky masonry in the first place does not relate to. Many brick buildings from history nonetheless do through the wide-spread classical paradigm. Curiously enough, Greek temples express carpentry's formal principles in stone construction, while the formal principles of stereotomy are here only of secondary importance. (Semper et al. 2004, 725) The most important motives are the frame (triangular, rectangular upright, or rectangular horizontal) and the supports; moreover, the integration of the previous two motives in a self-completed whole.

When formal principles of carpentry are expressed in brick masonry, the presence of various building parts that fulfil different structural functions, actually or symbolically, are articulated. Brick masonry is in this case structured by the expression of walls and floors, posts and lintels, pilasters and cornices, and supporting and supported building parts. Brick masonry that naturally is inclined to textile principles of surface making – due to the presence of the web of mortar joints – now has to articulate linear elements. Formal means in support of this effort are the articulation of edges in combination with relief. We can also think of contrasting brick patterns in adjacent elements. Textile patterns become useful in framed areas and support the reading of the linear elements as structural (even if only symbolically).

Brick buildings that subscribe to a classical paradigm are easily associated with the expression of carpentry's motives. Many of the later brick building of the office of Hans Kollhoff serve as a good example. (The Dutch Ministry of Internal Affairs in The Hague (2008-2012); Housing Malchower Weg, Berlin (1992 - 1994)

In contemporary brick architecture the motive of the post and lintel also find a freer interpretation, such as in the work office Winhov. (Housing Towers De Loodsen , Amsterdam, 2001-2006; City Archive Delft, 2014-2017, in collaboration with Gottlieb Paludan)

Stereotomic expressions in brick masonry

In terms of tectonic expression, stereotomy is quite a difficult technical art to use as a formal reference, because its repertoire of formal motives is relative small. Its technical and formal ideal is the monolithic, undivided stone mass. Semper asserts that 'The most perfect stone construction does not reveal that its construction is composed from many pieces, such as in the foundations of the Parthenon.' (Semper et al. 2004, 727)

The craft of the stone cutter strives for a perfect fit of surfaces at which stone blocks meet; the better the surfaces fit one another the lesser the expression of the joint. To achieve a kindred perfection of the joining surfaces in brick is hardly possible due to the material clay and the production process that turns it into brick. The mortar joint is needed in brick masonry to mediate the brick's inevitable imperfect measurements. Technically it turns the assembled building parts of relative small size into a monolithic or solid construction, while formally it expresses that this construction is conjoined. The monolithic characteristic of stone construction in brick masonry can formally be approximated in quite different ways that even can contradict each other.

One way is to suppress the expressiveness of the mortar joints by matching their colour with the colour of the brick, drawing the two materials closer to each other and subduing the composite nature of brick masonry. Also, the size of the brick in relation to the size of the whole building is relevant in this regard. Take for example the Pireus housing block in Amsterdam (Hans Kollhoff and Christian Rapp, 1989-1994); it is of such an immense size that when the building is perceived as a whole the single units of the bricks are no longer perceived. The Pireus appears as a huge monolithic mass which is sculpted.

Another way is to express the monolithic character of brick masonry is by stressing its earth relatedness by emphasising the horizontality of its stacking. This can be done by accentuating the bed joints, by reducing the size and/or number of the headjoints, and through the use of extraordinary long bricks.

A different way to express the earth relatedness is to deliberately use bricks which are irregular in shape, colour and surface texture. A combination with a very expressive joint which can contrast in colour, is thicker than conventional joints, is flush brush-finished to accentuate the irregularity of the bricks can accentuate this.

Wild bond as joining pattern seems to strive or the same effect.

The surface percentage of the joints may equal or even exceed that of the bricks. (e.g. Islev Church in Rodøvre by Inger and Johannes Exner, 1970).

The roughness, irregularity and unevenness of the surface texture evokes an association with the drawing in natural stone or the rough grain of the monolithic stone layers of the earth. The Kolumba Museum (2007) by Peter Zumthor is a building that combines a few of the previous principle.

Another formal principle of stone construction is 'the gradual reduction of the constructional mass from bottom to top' (Semper et al. 2004, 734); it is at the time a technical principle. It finds expression in military fortifications and in works of civil engineering, but it is hardly expressed in civic architecture. Cities such as Amsterdam or Berlin prescribed this gradual reduction of the loadbearing wall in its 19th century building codes by relating the number floors to the thickness of the walls. Usually this reduction of the wall thickness was accounted for at the inside of the building volume resulting in the gain of half a brick in the nett floor area per higher storey.
One of the few brick building that exploits this motive at the outside is Hans Heinrich Müller's *Stützpunkt Zeppelin* in Berlin (1928). The façade thickness of this five-floor building is reduced by half a brick per floor at the exterior. The ground floor and the edges left, right and at the top stay in the building line. Each recess per floor is horizontally accompanied by a rowlock that terminates the lower level. With every higher floor the recesses on the vertical edges gradually turn into square mouldings of finally four, header-sized steps that at the top of the façade culminate in the cornice which they articulate at the same time by turning into the horizontal direction.

But we have not yet touched upon the important motives that associate stone construction with a spatial idea: the arch and the vaulted ceiling. Semper asserts that the history of masonry construction 'virtually amounts to a history of architecture because of the vault's victory over the straight tectonic ceiling and roof structure paired with its columnar apparatus'. (Semper et al. 2004, 757) He wanted to discuss this topic in the third volume of his magnum opus which, however, he never succeeded to complete.
The era of arches and vaulted ceilings certainly did not last to the present day. More economic ways to span wall openings and interior spaces have long ago concluded at this mode of construction. But for Louis Kahn the spatial idea was substantially related to the loadbearing construction. Consequentially, he considered the arch an essential motive in brick masonry which he meant to revitalize with his well-known mystical dialogue asking 'Brick, what do you want?'; and letting the brick answer 'I want an arch', despite of the economic restrictions that he was well aware of. (Kahn and Latour 1993, 125) In contemporary brick architecture, we witness quite recently perhaps the harbingers of indeed a recurrence of the arch. I am thinking of the Bremer Landesbank by Caruso St John (2016); or of WestBeat, the winning tender for a mixed-use urban block in Amsterdam by Studio NineDots (2019).

Conclusions

The previous reflections show that the tectonic nature of brick masonry oscillates between the poles of textile expression (non-loadbearing, filigree construction) and stereotomic expression (loadbearing, solid construction). It is the mode of construction that suggests this ambiguous nature of its tectonic expression, while brick masonry also can assume expressions of ceramic and of carpentry.

Tectonic expressions may be combined as in traditional architecture or the primitive hut, where each tectonic realm was associated with one of the four elements of architecture (the fireplace, earthworks, the roof and its supports, and the spatial delineation). A particular tectonic expression may also dominate the appearance of an entire building.

Already in the primordial technical arts tectonic principles or motives could be combined and generate hybrid forms of appearance; for example, as in the basket, which is a bowl that is constructed with textile means; or, the other way around, as in the ceramic vase that is dressed with coloured and indented textile motives.

As if the ambiguous tectonic nature of brick masonry were not enough, also here motives of different tectonic realms can be combined. An extreme example is the cigarette factory Haus Neuerburg in Hamburg (1928) by Fritz Höger, which famously combines a columnar pilaster with the linear textile motive of a round cord.

What can we learn from this thoroughly ambiguous tectonic nature of brick masonry? First and foremost, there is no single truth of tectonic expression in brick architecture. There is neither an honesty of material(s), nor one truth of construction which would imply a single tectonic expression in brick masonry. Instead there are manifold possibilities for tectonic expression.

This, however, does not mean that anything goes. The materials brick and mortar, combined in brick masonry, come with restrictions and with possibilities which have to be considered; Semper would say, they have to be mastered. The restrictions concern technical and constructional matters; and they also concern formal matters (presence of joints, sizes of bricks, modularity of brick, logic of linear and of surface pattern making, edge conditions of these patterns). Each of the possible tectonic expressions must master these constraints to arrive at a convincing tectonic articulation.

The reality of contemporary building construction is entirely hybrid, a façade with facing brick is a layered construction: interior facing, gypsum board or loadbearing wall, vapour barrier, insulation, waterproofing, cavity, brick wall-ties, steel auxiliary constructions with their own assemblage of linear bracing at intervals supporting brackets, the facing brick masonry, eventually with reinforcement in the joints. Technically spoken, the facing brick wall is today almost everywhere a cladding.

This “truth” of constructional reality could actually be utilized as an argument for the expression of a textile tectonics, but this is not the point that I want to make here.

My position on tectonics is inclined to the surface position which in my opinion may adhere to all modes of tectonic expressions independent of its actual structural performance. But I am also concerned about the deep structure as soon as it exerts an effect on the surface of brick masonry that can be experienced. Then these technicalities should be addressed aesthetically, that is, tectonically. Contemporary construction techniques of brick masonry do challenge the surface appearance of brick masonry: The expansion joint, the montage joint of prefabricated brick elements, material fatigue of steel substructures, and other technicalities require such an attention.

To return to Louis Kahn’s dialogue, it seems that the brick could have also replied: I want a monolithic mass. I want a brick dress. I want a moulding. I want a tripartite articulation. I want post and lintels. All of these tectonic expressions in brick masonry are fine with me as long as they are addressed with according tectonic thinking.

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